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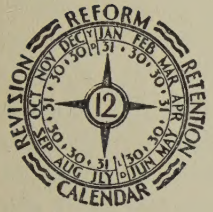

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ORIGINS OF TIME MEASURE

By JAMES HENRY BREASTED

Most distinguished of American archeologists of the present generation, the late Prof. Breasted had long been interested in calendars, past, present and future. A few months before his death he delivered at New York University the annual James Arthur Lectureship on Time and Its Mysteries, under the title "Beginnings of Time Measurement and Origins of Our Calendar." The abbreviated version printed herewith may be supplemented by consulting the complete text as published this month by the New York University Press in a book "Time and Its Mysteries," which contains also the text of lectures by Professors Robert A. Millikan, John C. Merriam and Harlow Shapley.

PROCESSES of matter seem to be the most tangible yardstick which we can apply to that mysterious flow which we call time. But the processes of matter are sublimely indifferent to the insignificant time frontiers erected by man's petty scientific terminology. As if in ridicule of such barriers raised by the children of time, the operations of the universe cross and recross the tiny areas which man has staked out. We are like some frontiersman in the night holding up a torch over a dark stream and imagining that the circle of its hurrying current revealed by the torchlight is all there is to the stream, while there may be Great Lakes above and a thundering Niagara below.

In this brief discussion of a vast subject let me make it clear that I am not dealing with any philosophical conceptions of time or its nature. I am merely endeavoring to present a sketch of some historical aspects of

man's notions of time, by a study of the earliest sources of information available, with the purpose of disclosing especially the earliest known methods of time-measurement and the origins of our calendar.

Modern science has so long been dealing with time as something in *continuous* flow that we accept this conception as a matter of course. This notion of time, however, as uninterrupted duration, in ceaseless, ever-continuing flow, was the final result of ages of human effort to deal with it, and did not arise until an advanced stage of civilization. An American Indian, before he was touched by civilization, would have told you that he was "fifty winters" old, or a younger native would have said that his age was "twenty snows." He thus measured time in disconnected fragments, and throughout the globe that has been the only conception of time discernible by primitive men. Some of these time fragments are fixed seasons in the early man's folk-calendar. Among certain Swedish peasants even at the present day a birthday may fall at the "rye harvest" or at the "potato harvest." A Palestinian peasant may fix the date when a note falls due, not at the end of a continuous series of months, but at the next ripening of the fakûs, a kind of cucumber. Convenient fractions of time may be designated as so many *nights*. In English we still have in common use the period "fortnight," an abbreviation of "fourteen nights." Somewhat less common is the term, "sennight," for "seven nights." This use of nights as a series of disconnected time fragments, still current in English, is of course a survival from primitive usage, like our own North American Indian's measurement of a short journey to a mountain visible on the horizon as "so many sleeps." For a longer journey, however, to the sea far behind the mountain, the Indian would say, "so many moons."

For ages the primitive man had no conception of time, but merely of a series of disconnected units of time, what modern investigation calls "discontinuous time." The short period during which the moon disappears is so brief that a succession of moons was not broken up into disjointed links, and a series of moons therefore gave the early man his longest uninterrupted flow of time. The moon thus became the first continuous time-measurer for periods of time within the year. Almost everywhere the primitive woman knows that, ten moons (that is about nine months) after her periods have stopped, her child will be born. That measurement of the length of pregnancy is one of the oldest continuous time units on record; but it fell short of a year by almost three more moons. The process of linking together the disconnected time units to form a year and thus build up a calendar was an achievement belonging to an advanced stage of civilization.

The cycle which we call a year was of course early observed by primitive man. The changing phases of the face of nature could not fail to attract his attention nor could he fail to notice that certain of these phases

recurred with great regularity. On some of them he was dependent for sustenance and life itself. Every day there impinged upon him some aspect of the natural world, of sky and earth in a sweepingly wide range, from the far-off celestial bodies above to the changing life below, of trees and plants, cattle and birds and insects, and the sacred observances of man himself, based to no small extent upon occurrences in the natural world. While he had noted these recurrences for ages, the early man made no effort to determine the number of days in the cycle between any one of these events and its next recurrence, and thus to establish the length of the year. Simple as it seems to us, the conception of the year, the length of its duration and the mere arithmetic of counting the days which it occupied were far beyond human powers at first. What he did at first observe, however, was that the seasons recurred after an interval of about twelve moons. For ages his ideas of the length of year remained wholly vague as a group of roughly twelve moons. Gradually each moon month gained a name drawn from some event in the life of plants and animals, or some sacred observance of man himself connected with such an occurrence in nature.

The effort to fit the series of moon months into the cycle of the year was never successful. Throughout the ancient world, especially in western Asia and Greece, man struggled with the practical problem of the incommensurability of the length of the year and the moon month. We are accustomed to say that the Greeks were the first people to gain complete intellectual emancipation, but in the measurement of time their men of science suffered under such complete intellectual subjection to inherited tradition in the use of the moon month as a subdivision of the year that they continued to use a year divided into months, of which there were twelve and a fraction in each year. They resorted to elaborate devices for making a term of years equal to a given number of integral moon months. They devised a cycle of eight years with three intercalated moon months or, more accurately, of nineteen years with seven intercalated moon months. The engineer Meton, who adopted the nineteen-year cycle from acquaintance with Babylonian astronomy, knew well enough that his elaborate cyclic scheme did not match exactly with the observed new moons. In view of this fact it is most extraordinary that the Greeks never possessed the intellectual emancipation to reject the moon entirely from their calendar and adopt a conventional month dictated by social needs. They knew of the Egyptian calendar, and in the middle of the fifth century B.C. Herodotus praises it, evidently under the impression that its year of 365 days was correct. But the Greeks had inherited their lunar calendar from Babylonia, and it was so firmly entrenched in their life, beliefs and customs that they were never able to cast it off.

From the earliest times the lunar month dominated the calendar of

western Asia, where it arose at least as early as the fourth thousand-years B.C. under the leadership of Babylonian civilization. The Babylonian kings at first adopted an erratic method of intercalated months inserted at irregular intervals, by royal command whenever the king noticed, as Hammurabi says in one of his letters, that "the year hath a deficiency." He then ordered the insertion of an intercalary month. It was not until 528 B.C. under Persian sovereignty that Babylonia adopted a fixed lunar cycle for the insertion of intercalated months at regular intervals. It was this cyclic system which was introduced from Babylonia by the Greeks. At the very time when the Greeks were thus fastening upon themselves the intolerable inconvenience of a lunar calendar they might have observed that Darius the Great, the ablest administrator of the ancient world, had introduced into the Persian Empire the Egyptian calendar, which disregarded the moon month. The long-established habits of the Western Asiatic peoples, however, and especially the eventual triumph of Islam, resulted in the universal restoration of the lunar calendar. The disharmony between the lunar and the solar year was carried to the absurdest conceivable extreme by Mohammed, who was so densely ignorant of the nature of the calendrical problem that in the Koran he actually forbade the insertion of intercalary months. The so-called "lunar year" of 354 days, being eleven days shorter than the solar year, revolves entirely around the solar year in a little over thirty-three years, that is, about three times in every century.

The authorities of the Jewish church in the Orient avoided such absurdity, and employed intercalation to keep their lunar calendar at least roughly within the framework of the solar year. All western Asia therefore still continues to suffer under the inconvenience of the most primitive form of time-measurement, the lunar calendar.

The Egyptians were the only ancient people who clearly recognized the cause of that inconvenience and possessed the courage and intellectual freedom to remove it. The total incommensurability of the solar or stellar year and the so-called "lunar year" could be discovered only after determination of the length of the solar or stellar year, and recognition of the fact that there is no such thing as a "lunar year."

The determination of the length of the year, together with the discovery that it had a fixed length, was a long slow process lying far back in prehistoric ages. As we shall see, it is an extraordinary fact that it was not the sun which first furnished early man with the length of the year. Other natural phenomena much more intimately within his circle of observation must first have revealed to him the beginning of another annual cycle. The beginning of the annual run of salmon, the blossoming of certain plants or, after the introduction of agriculture, the successive tasks of cultivation might mark the years. The peasants of Palestine call

the years so many "threshing floors"; the Arabs of Lower Iraq count the years by "date harvests"; in the East Indian Archipelago the years are counted by "rice harvests." The conception of a year thus arose gradually. On the East Indian Island of Bali the two monsoon seasons are each made up of a list of months which have the same names and are therefore identical for the two halves of the year. This fact shows us that the two seasons were separated from each other and the conception of the complete year cycle had not yet arisen. The process of uniting the seasons into a year was therefore a slow and gradual one. At first, as may still be observed among some surviving primitive peoples, there arose a list of moon months which did not fill the entire year. After those months were past, before the beginning of a new year, there followed a period of indifferent length, completing the old year. This intermediate period of varying and indifferent length served to adjust the inequality between the solar year and any number of integral lunar months and brought the months into rough correspondence with the solar year. Eventually there arose a list of lunar months, twelve to thirteen in number, which were thought to fill the entire year. There is, however, no equivalence between an arbitrary series of lunar months and a solar or stellar year. Hence there really is no such thing as a "lunar year," and Mohammed's year of 354 days is a creation which corresponds to nothing in nature. Historically, the lunar month has been useful as first suggesting a convenient series of twelve subdivisions of the year, but beyond that fact it has caused endless confusion and complication throughout human history.

The lunar month of course contributed nothing to the determination of the length of the year, and curiously enough the sun, the other great luminary, did not first enable man to discover the year and determine its length. While the sun's apparent revolutions shift their positions from season to season they nevertheless go on in an unbroken series with no beginning and no end. The sun's apparent motions therefore did not at first suggest the year cycle. It is quite evident that primitive men had very early begun to observe the stars and to notice the reappearance of a prominent star or group of stars after it had been invisible for a time. Such a reappearance was an event which cut sharply into the sequence of events in the stellar sky, and easily came to mark the beginning of the year. In several regions of South America the word for Pleiades is the same as the word for year. In the eighth century B. C. Hesiod places his agricultural program in the calendar by observing the return of the Pleiades in May. If the Greeks had only continued to build up their calendar on this stellar observation, they might have saved themselves centuries of difficulty and complication with their inherited Babylonian lunar calendar.

In prehistoric ages, many thousands of years ago, the dwellers along the Nile, the greatest river known to ancient man, very naturally began

their year with the beginning of the annual rise of the vast river, as the most important terrestrial phenomenon of which they knew and also the source of fertility on which an agricultural people depended for their very life. The four-month season of the inundation, which fructified the fields, was followed by another four-mouth season of planting and cultivation, and a third and final four-month season of harvest. This year of three four-month seasons was obviously one which arose out of the life of an agricultural people. It was essentially an agricultural folk-calendar, and its months were obviously moon-months in the beginning and doubtless continued to be so for thousands of years.

But, like primitive man everywhere, these earliest known agricultural peasants along the Nile had begun at a very remote date to scan the heavens and observe the stars, probably some thousands of years before Hesiod was doing the same in the eighth century B.C. There is probably no other country in which Sirius, the Dog Star, the brightest of the so-called fixed stars, is such a brilliant and noticeable spectacle in the evening sky. In the latitude of Lower Egypt Sirius rises about four minutes earlier every day. Every fifteen days he rises about an hour earlier, so that eventually he rises in full daylight, when he is of course entirely invisible. After a period of some months of invisibility, this brilliant and beautiful star suddenly reappears on the eastern horizon at sunrise. This "heliacal" rising of Sirius, as it is called, is a noticeable and sharply defined event. By a remarkable coincidence this heliacal rising occurs very near the time of the beginning of the inundation. In antiquity this date was the nineteenth of July. By a lucky accident, the beginning of the year at the advent of the inundation in the enormously ancient peasant calendar was thus fixed at the moment of an important astronomical event. The basis of the calendar which was to become that of the civilized world was therefore a stellar, not a solar year.

It is important to notice that the earliest observances of the heliacal rising of Sirius must have been very primitive in character, as we shall later illustrate. Persistent dust storms, such as we experience today, desert fogs and mists or sometimes storm clouds must have made the determination of the exact day when Sirius reappeared on the eastern horizon not a little uncertain. It is certain that the length of the stellar year as measured by successive sunrise reappearances of Sirius was at first roughly established by the Egyptians as 360 days. As early as the fourth thousand-years B.C., that is, well back of 3000 B.C. we find this 360-day year divided into thirty-six decads of ten days each, for grouping the constellations along the celestial equator. This appearance of a circle of thirty-six decads in the fourth millennium B.C. is highly significant. It is certainly the oldest appearance of a circle of 360 divisions. The Sumerian sexagesimal system, in which sixty appears as a numerical unit (called

šuššu), is without doubt enormously old; and in all probability arose from the length of the year—360 days—by dividing it into six parts. It seems probable, as concluded by Zimmern, that *šuššu*, the Babylonian word for sixty, means "one sixth." In both Babylonia and Egypt the convenient and basic number (360), of fundamental importance in the division of the circle and therefore in geography, astronomy and time-measurement, had its origin in the number of days in the year in the earliest known form of the calendar. While its use seems to be older in Egypt than in Babylonia, there is no way to determine with certainty that we owe it exclusively to either of these two countries. A common origin older than either is possible.

The Egyptians found their primitive 360-day year very convenient in business and social life, and it therefore survived far down into the historic age; but as their observations of the heliacal rising of Sirius accumulated, they finally discovered that the year, as they thought, contained 365 days. We are in a position to determine the date when they took administrative action to make this discovery of the approximate length of the year practically effective. In the year 4236 B.C., as determined by Borchardt, some now unknown ruler of prehistoric Egypt, without doubt residing in Heliopolis, introduced a calendar year of 365 days. It began with the heliacal rising of Sirius, that is, on the nineteenth of July. This calendar contained the three old agricultural peasant seasons: the inundation, the cultivation and the harvest, each season containing four months. The epoch-making importance of this calendar lies in the fact that these twelve months were entirely divorced from any connection with the moon, so that the deviser of the calendar could make each month thirty days long. By the addition of five feast days at the end of the year, this year of twelve thirty-day months or 360 days became the earliest known and practically convenient calendar of 365 days.

The only celestial phenomenon to which any attention was paid in devising this calendar was the establishment of the beginning of the year at the first heliacal rising of Sirius. In other words, the mind that devised this calendar put social and economic needs first and divorced the calendar from celestial processes. It is of the greatest interest to observe that this calendar inevitably soon parted company with Sirius, for, owing to the fact that the stellar year is about a quarter of a day longer than 365 days, Sirius rose a day late, every four years; that is, at the end of the fourth year after the introduction of the calendar he rose on the second day of the New Year or one day late; at the end of eight years two days late; that is, on the third day of the year; at the end of twelve years three days late; that is, on the fourth day of the year; and so on to the end of the year. The calendar-makers did not at first observe this discrepancy, and when they finally did become aware of it, they held to the supremacy of social con-

siderations, and made no attempt to shift the calendar back into harmony with Sirius. Eventually, therefore, in four times 365 years, that is in 1,460 years, the Egyptian calendar revolved entirely around the celestial year. A remark by Censorinus informs us that in the year A.D. 139, Sirius rose on New Year's day, that is, New Year's day in the civil calendar of Egypt once more coincided with the heliacal rising of Sirius. It is easy to compute that the next earlier coincidence of this kind must have occurred in 1318 B.C., the next earlier in 2776, and a still earlier one in 4236 B.C. Archeological considerations forbid us to suppose that we may push back still another such period of 1,460 years. We may therefore conclude that the civil calendar of Egypt was introduced in 4236 B.C.

This date, near the middle of the forty-third century B.C., is not only the earliest fixed date in history, but also the earliest date in the intellectual history of mankind. It has been well said that "the Egyptian calendar is the greatest intellectual fact in the history of time reckoning," but it is far more than that. For the introduction of this calendar was an intellectual feat, marking the dawn of a recognition of the supremacy of social requirements. As we have already remarked above, in divorcing this new calendar from the processes of nature, the Egyptians were recognizing for the first time a world of social needs which they placed first. It is today the earliest known such recognition, and the earliest dated intellectual event in human history. It ushered in the great epoch, which was in full development after 4000 B.C., when the Egyptians discerned that their once purely nature-gods, who had originally been only personifications of natural forces and natural phenomena, like the Sun-god Re, or the Vegetation-god Osiris, were gradually shifted from a world of natural processes to be arbiters in a newly discerned social arena, where moral forces were emerging. The calendar was thus the beginning of a great movement in human life which carried over the thought of man from the world of nature to the world of human life.

This remarkable calendar remained the exclusive possession of the Egyptians for over thirty-five hundred years after its introduction. The effort of Darius the Great to introduce it into Western Asia late in the sixth century B.C. proved unsuccessful. The Greeks, as we have seen, wasted their scientific gifts in adding one futile refinement after another to the hopelessly inconvenient and complicated Babylonian lunar calendar. Nearly four and a half centuries after the fruitless attempt of Darius, another great administrative genius gave Europe for the first time a sane calendar. In 46 B.C. Julius Caesar introduced into the Roman Empire the Egyptian calendar, with one important modification. He provided for the addition of one day to the year of 365 days once in every four years. The history of this important innovation is interesting.

The first knowledge of a year of 365 days was brought to Europe by

Thales, the Ionian philosopher, who learned of it on a visit in Egypt. Curiously enough, Herodotus also learned of it there and praises it as a perfect solution of the complications due to the incommensurability of moon-month and year. Neither Thales nor Herodotus seems to have known that the year of 365 days was too short. It is obvious that the Egyptians early observed the rate at which the heliacal rise of Sirius diverged from the beginning of the calendar in their civil year, revealing to them that their 365-day year was a quarter of a day short. The extraordinary achievements of the Babylonian astronomers in the Chaldean and Persian periods included a computation of the length of the solar year by Naburi-mannu, or Naburianos, as the Greeks called him. Not long before 500 B.C. this great astronomer calculated the length of the solar year as 365 days, six hours, fifteen minutes and forty-one seconds—a result which is only twenty-six minutes and fifty-five seconds too long. This is the earliest known close approximation to the length of the solar year.

For over a century and a half no one seems to have made any practical application of this new knowledge. It was not until the third century B.C. that the Egyptians made an effort to correct the error in the length of the year. We still possess the granite stela of Ptolemy Euergetes I, bearing his decree, dated in the year 238 B.C., which commanded that every fourth year should be one of 366 days. But the Egyptian people obstinately refused to conform to this decree, and the correction in the calendar never became effective.

In 380 B.C. the able Greek astronomer and mathematician Eudoxus visited Egypt and there learned the fact that the year was really about 365¼ days long. Then for the first time this fact became common knowledge in Europe. Some two centuries later, that is, early in the second century B.C., the great Greek astronomer Hipparchus announced that 365¼ days was in error, that is, it was too long by one three-hundredth of a day. This error was unknown to Caesar, and we all know that for this reason in March, 1582, the Julian calendar was superseded by that of Pope Gregory.

It is evident, however, that Julius Caesar brought to Europe for the first time a sane calendar system of twelve thirty-day months. If jealous Roman emperors and other scientifically ignorant meddlers had not utterly disfigured the Egyptian calendar, we would not be calling the ninth month September (with the numeral seven), the tenth month October (with the numeral eight), the eleventh month November (with the numeral nine) and the twelfth month December (with the numeral ten)! Nor would our young people be obliged to learn and repeat a verse of poetry in order to find out how many days there are in a month.

With the introduction of the Egyptian calendar time became something in which *human* processes were, so to say, systematically staked off into

annual stages and substages. These subdivisions of a calendar, particularly the shorter ones, arise only at an advanced stage of social development. The origin of the month was of course due to a celestial phenomenon, but that of the week was in origin purely human and social. A market week of three, four, five, six, eight and ten days is a calendar division of purely secular origin. It is found over practically the entire globe, where civilization has advanced sufficiently to possess arts and crafts, with exchange and commerce of a primitive kind. It is quite commonly a *rest* day on which work is forbidden. There is a universal connection between market day and religion. Among some peoples, as among the Hebrews, the religious significance of the day predominates, and the feature of rest becomes a religious mandate. For our subject, the week, whatever its origin or significance, is of slight importance, for the week has played practically no part in time-measurement.

For many reasons, which are too obvious to need enumeration, the smaller subdivision, the day, has always been of fundamental importance in the measurement of time. It is extraordinary that among the various peoples there should be such wide diversity in the understanding of just what a day is. Modern astronomers consider a day as beginning at midday and therefore lasting from midday to midday. The peoples having a lunar calendar conceive the day as lasting from evening to evening; while in modern life the day begins at midnight and lasts from midnight to midnight, a point of practical convenience as marking the transition from one day to the next, and ignoring the night. This conception of a twenty-four-hour day is not even yet in our railroad time-tables. We really have two periods of twelve hours each, very inconveniently distinguished in our time-tables by leaded or black-faced type suggesting darkness at *midday*, which we sagaciously shift to light-faced type, suggesting daylight at *midnight!* The modern languages possess no word for the twenty-four-hour day. Only the ancient Greeks seem to have possessed such a word in their convenient νυχθημερον. The Egyptians began the day at dawn, which seems the natural thing for an originally peasant people to do. The practise of beginning the day at dawn was adopted by Europe at an early date, and continued down into medieval times. It was the introduction of the striking clock, in the fourteenth century of our era, which shifted the beginning of the day to midnight.

There was as much diversity in the *length* of the day as in the time of its beginning. In view of the varying length of the *daylight*-day no one finds anything strange about a flexible or elastic day. It is in the subdivisions of the day that we have come to expect constant length. Division of the day into hours is unknown to primitive peoples. The Greeks and Romans in the West and the Chinese in the East had originally no hour divisions of the day, which they all received from the Near East. The

Greeks were accustomed to identify times of day by such cumbrous devices as "the time of full market," which was the middle of the forenoon. Subdivision of the daylight-day into twelve parts was introduced into Egyptian life at a very early date. We find it in the Pyramid Texts, and this means that it was practised in the fourth millennium B.C., that is, before 3000 and possibly as early as 3500 B.C. The Egyptian was interested in a convenient division of his day into twelve parts, but he was not concerned that these twelve parts should be of constant length. The reason for this probably lay in his early timepieces. The Babylonians also possessed a subdivision of the day at an early date, but it divided the daylight-day into six parts, and the night into six more.

Of periods longer than a year the primitive mind had but the vaguest conceptions. Indeed primitive men may entirely lack the *conception* of even a year.

With the advance of civilization man's increasing knowledge has had a profound influence upon his conceptions of time, and especially his discernment of ever-lengthening periods of time. The astonishingly long reigns claimed for their early rulers by the scribes of Egypt and Babylonia must have been compiled in a primitive age of naive and childish fancies, whose fantastically impossible periods could not have grown out of any just impressions of time as measured by human history.

The earliest known annals of a nation compiled in the twenty-eighth century B.C. covered some fifteen hundred years of human history, that is, they extended from the forty-third to the twenty-eighth century B.C. The men of the Pharaoh's court, therefore, in the twenty-eighth century B.C., that is, some 4,700 years ago, could look back upon a lapse of time a little longer than that which we survey as we contemplate the period that lies between us and the so-called fall of Rome in A.D. 476. For those men time had long since ceased to be a discontinuous duration.

In Babylonia the cycle of nineteen years for the intercalation of the lunar months evidently discloses a conception of time as a continuous flow of duration. It was introduced in 528 B.C.

It is evident that historical impressions of the long and continuous flow of time, especially for some centuries before the beginning of the Christian era, had led the men of the Hellenistic Age and the early Roman Empire to their dreams of a thousand years, which have left us the rather misleading significance of the word "millennium" as a Golden Age.

It is rather natural science than human history which has so enormously expanded our modern conception of the flow of time. About 400 B.C. the Chaldean astronomer Kidinnu, whom the Greeks called Kidenas, discovered the precession of the equinoxes, involving a cycle of twenty-six thousand years. That was the longest period revealed by the vast celestial clock for many centuries, indeed, perhaps even into modern times. It was

followed by the geologists' estimates of the length of the periods required for the formation of the earth. Much more precise are their computations of the length of the much later process which has produced the present surface of the globe.

The computations of De Geers have shown that it is about nine thousand years since the retreating ice of the Glacial Age reached its present latitude, while the investigations of the American geologists would indicate that the Ice Age began probably a million years ago. Such researches have revealed to us this imposing panorama of terrestrial processes as the vast stage where we discern earliest man emerging as the only implement-making creature, whose prehistoric life is thus disclosed interlocking with the processes of nature, which formed our globe. It is a tremendous spectacle: the geological process, marching hand in hand with the cultural advance of man.

Such disclosures of the position of man in the universe form for us the culmination of man's sense of time as an historical process no longer discontinuous. We begin to feel a range of time measured by the emergence of the life of man in the universe, until we are aware that there is no time apart from man. Those celestial processes with which our knowledge of duration now begins, as they are disclosed to us in incomprehensible gulfs of millions of light years, are for us essentially timeless. We now recognize that modern investigation of early man has revealed him to us filling the gap between the incalculable duration of the celestial processes on the one hand and on the other the more comprehensible periods of the terrestrial processes that formed our globe as the home of man and led over to the historic age.

Thus in vastly remote prehistoric ages, when the present surface of our globe was being fashioned by geological forces, we begin to see man, all unconscious of those forces about him, but suddenly revealed to us rising out of them and entering a realm of time, because he was, and still is, the first and only creature to be aware of time. He was its creator, the first being possessed of the ability to look back along his own trail and to recognize the point in the timeless process of the universe where the creature man entered a new and mysterious realm, which by that very fact made him the creator of a domain of time.

PRIZE ESSAY AWARDS

AWARDS of three prizes for essays on calendar reform have been made by the editors of the British magazine, *Mine*, published in London. The terms of the contest provided that the essays must be suitable for use in broadcast talks or interviews. Winners of the contest were: *First prize*, Caldwell Harpur, Gwythian Road, Hayle, Cornwall; *second prize*, Miss Jocelyn Allan, 37 Upper Brook St., London; *third prize*, Miss Kathleen Wildman, 74 Chingford Mount Road, South Chingford, Essex. The winner of the third prize is a British school girl, 13 years old.

A PLAN FOR ENACTMENT

By Doctor Walter Simons

Former Chief Justice of Germany

IT is my opinion that calendar reform is an international movement which calls for international participation and action. In 1923 the League of Nations undertook the leadership in the movement to bring about an improved calendar for the general benefit of mankind throughout the world, and in 1931 called together an international conference at which 44 nations surveyed the economic and social aspects of the simplification of the Gregorian calendar. Germany took an active part at the conference and her delegate clearly and emphatically stated her position in the following terms:

> "Some speakers have erred, I think, in saying that the present world economic crisis prevents serious consideration of calendar reform at this time. They have stated that 'in the existing depression, it is necessary to concentrate attention on problems of more vital importance.'
>
> "The German delegation takes an opposite view. In fact, it is the present economic crisis which seems to us the most urgent argument for breaking away from old institutions created for other periods and operating to hamper and injure modern economic activity.
>
> "This is the reason why the great majority of organizations consulted by the German Committee have pronounced themselves in favor of calendar reform. It is a reason which the German Government has made its own and supports emphatically.
>
> "In Germany the inconveniences of the present calendar have been discussed very thoroughly with industrial organizations, both on the side of employers and employed, and with representatives of education and science. We find that the inconveniences of the present calendar are generally recognized—the inequality of the different parts of the year, the instability of the calendar and of the date of Easter.
>
> "I do not want to waste your time over these details, which are so well known to you, but I wish to catalogue them briefly to emphasize the tremendous importance of the economic factors which in our opinion make the immediate consideration of calendar reform desirable."

Today, in a world of seriously disturbed conditions, the peaceful calendar reform is most opportune and increasingly important, as there exists in the movement no national preference, special interest and political bias. I believe therefore that the League of Nations should welcome international action and enactment of calendar reform which it has so consistently advocated, and will set in motion definite and constructive steps leading toward an international conference being called in 1937 at which international enactment will enable the revised calendar to be put into operation by 1939. Its success in the matter would immediately enhance the League's prestige and authority. It should prove a grateful task, in the sense of the Article 23 of the pact, to render possible a closer

relationship between the nations of the world through a vigorous and timely promotion *now* for a uniform and improved calendar.

If, however, the League should not act in the matter, then it is very possible—indeed most probable—that some leading government, whether it belongs to the League of Nations or not, would lead the way toward enactment of calendar reform. It could through legislative means in its own country, enact the proposed new calendar, with the provision that the revised calendar would become valid throughout the country, whenever it should have been similarly adopted by a determined number of other governments. And toward this accomplishment it could call an international conference.

As to the calling of an international conference by a single nation, the German Reich might well take such a step, which in its transcendental importance, affects the culture and civilization of the entire world and its leaders as well as the man-in-the-street. Germany is in a position to make such a move, owing to its world-wide trade relations and contacts with other countries.

Amicable international accord is not a visionary ideal but a practical reality, as was clearly demonstrated in the Easter Act Resolution endorsed by the League of Nations in 1931 and which received the unqualified approval of 26 nations. Among them were Great Britain, France, Italy, Spain, the United States of America, Sweden, Chile, Switzerland and Greece. I am glad to say Germany was one of the signatory nations approving the Act.

For more than a decade there has been heard, with an increasing frequency of opinions from the circle of the Christian-Ecumenical church movement, a strong voice advocating the unification of the calendar. The interest of churches can be explained by the uncertainty of the Easter date, which is still determined at the present time according to the phases of the moon and not according to the solar year. The origin dates from the Jewish Passover.

It is a well-known fact that this traditional adherence, which sets the Easter date on the first Sunday after the full moon following the Spring equinoxes of each year, received its sanction during the reign of the first Christian ruler of the Western world, Constantine the Great, in the fourth century A.D. Easter fluctuates within the extreme limits of 35 days and in addition to this, there is a diversity of dates on which Easter is celebrated by the Greek-Orthodox and other Christian churches. This fluctuation of Easter, upon which many other Christian holidays depend, is of utmost importance not only for the church year, but for the school year, for the life in common of the members of the family and for the business life of every individual and nation. According to the general opinion, it is responsible for many inconveniences. On the other hand, cal-

endar reform would have as an immediate result, the establishment of a fixed date for the Easter holiday. It is hardly possible to conceive any objection being raised from a religious point of view against this fixation of the Easter date; on the contrary, it looks absurd that up to the present time, holidays, in commemorating the historical events in the earthly life of Jesus, should have been celebrated according to an arbitrary rule which results in such a wide range of dates. The first logical step would be to set the Easter Sunday on the day, which according to the historical and astronomical calculations, agrees with the greatest probability with the original history of the Passion. It seems that it should fall within a day or so at the end of the first week in April,—April 9th in the present and April 8th in the new calendar. For this reason the British Parliament, as early as 1928, declared itself in favor of fixing the Easter Sunday on the second Sunday in April, even though it did not have any intention at that time to improve the Gregorian calendar.

It is hardly probable, however, that the initiative for the final calendar reform should come from the churches, but it is more than probable that should calendar reform come the churches themselves would not offer resistance to such a reform.

The initiative of general calendar reform is reserved to the lay world. The trouble in the past has been that for this future calendar, multitudinous plans had been advocated by individual calendar reformers, who were actuated more from their preconceived ideas and one-sided point of view than from the broad outlook of the world at large. This situation was clarified and simplified at the international conference on calendar reform, in 1931, when from the higher point of view, two plans were chosen for further consideration: one of them advocating a year of 13 months and the other a year of 12 months, both of them having a uniform structure and certain intercalations. The contrast between the two reflects the traditions of the human calendar wisdom from time immemorial.

Nature has supplied mankind with three cardinal points as a base for measuring time: first, the change of day and night, then the change of the phases of the moon, and finally the change of the seasons of the year. A natural consequence of this was that mankind, from time immemorial, has measured the time according to days, months and seasons of the year. Unfortunately, however, these three measures of time are irrational in relation to one another. A month cannot be evenly divided into days, and a year cannot be evenly divided into days and months, and the seasons do not conform with the phases of the moon. A part of humanity has preferred to reckon time according to the phases of the moon, and the other according to the influence of the sun which causes the seasons. The 13-month calendar more or less follows the more subdued light, the

moon, and the so-called World Calendar, the more brilliant light, the sun.

All the nations which distinguished themselves in observing the skies and reckoning the time, were finally forced to adopt a combined solar and lunar year. The mere reckoning according to the moon rapidly gets at variance with the seasons of the solar year, and the mere reckoning according to the sun calls for complicated adjustments with the phases of the moon. In both instances, the true reckoning of the calendar forces upon it, at longer or shorter intervals, certain special periods of intercalation.

Those peoples who achieved the greatest progress with regard to the accuracy of this intercalary reckoning were the ancient Babylonians with their lunar calendar, the Egyptians with their solar calendar, which survives in our present calendar, and the highly gifted Central American Mayas with their astonishing calendar; whereas the Greeks and particularly the Romans always had a certain amount of confusion in their calendar until an end was put to it by the ingenious reform of Julius Caesar.

The Julian reform of the calendar, based on the Egyptian, introduced a regulated leap year by intercalation of one day and, after surmounting certain childhood diseases, held sway over the church and business life of the European world until the beginning of modern times. But even the Julian calendar with its intercalary system remained behind the true march of the seasons in the year, so that in the 16th century, Pope Gregory XIII was forced to advance the time by ten days, using a sort of "coup de main." His reform was at first accepted only by the Roman-Catholic Church, while the Protestant churches continued an opposing resistance, "for religious reasons," which lasted into the 19th century. The Greek-Orthodox Church even holds fast to the Julian system up to this date, likewise "for religious reasons," even though the countries where it dominated have adopted the Gregorian calendar for all matters of civil life after the end of the World War. As far as the non-Christian nations opened their doors to the European civilization, they have adapted themselves to the dominating calendar, but otherwise they still preserve a great variety of systems. Among them the Mosaic calendar plays a particular part.

The strongest initiative which is at work in Germany on calendar reform comes from the American World Calendar Association which has its headquarters in New York, but maintains at Geneva an international committee for cooperation and endeavors to encourage the work at the League of Nations. The World Calendar proposed by this Association is distinguished by a particular clearness, practicability and its evident conformity with the interests of the lay world as well as those of the churches. It consists of four equal quarters of three months each, which are com-

parable to the four seasons of the year; the first month of each quarter has 31 days, the second and the third 30 days each; each quarter of the year begins on Sunday. At the end of the twelfth month there is intercalated the year-end day (Sylvestre), and during every leap-year a mid-year or leap-year day is placed at the end of the second quarter of the year. These extra days are considered as extra Saturdays and are inserted at the end of December each year and at the end of June every four years respectively, by which the days of weeks and months exactly coincide with one another from year to year. Easter falls on April 8th, and the rest of the church year is regulated in accordance with it. There is provided in this plan, a clear, comprehensive and invariable standard both for the church and the business life.

No other plan and particularly the entirely unpractical 13-month calendar has the slightest prospect of general approval in comparison with The World Calendar. The mere fact that it destroys the half and quarter divisions of the year and nullifies the seasonal divisions of the year, (upon which depends man's nutriment and around which the farmer plans and reaps his crops), relegates the 13-month calendar to an extremely restricted scope of usefulness.

A calendar like that of The World Calendar Association with its practical and ideal arrangement, wherein all the various time-periods harmonize so perfectly with each other, would obviously have a like beneficent reaction in all its varied applications.

I am convinced to such a degree of the importance of this movement and of its usefulness to the world that I unhesitatingly give The World Calendar my wholehearted allegiance and am equally convinced that immediate steps preparing for its enactment should be taken by the League of Nations, and if this is not possible, then by an individual nation in order that the new calendar may become effective by January 1, 1939, a Sunday; that is, if the new calendar is to avoid any such violent measure as the reform adopted by Gregory XIII, wherein 10 days were dropped from the calendar.

In the fields of social betterment lie the outstanding successes of the League. Calendar reform gives it yet another opportunity for enhancing its prestige for world betterment, and in this effort, Germany stands ready to take her part with her sister nations.

CALENDAR DIFFICULTIES

DR. PAUL MONROE, President of the World Federation of Education Associations, submits the following official dating of a magazine devoted to the Near East and India, as an example of calendar difficulties existing in the world today:

"February 13, 1936 (New Style); January 31, 1936 (Old Style); Shebat 20, 5696 of the Jewish Calendar; Dhulkaada 20, 1354 A. H. of the Moslem Calendar; Amshir 5, 1652 of the Coptic Calendar; Bahman 23, 1314 of the Iranian Calendar."

DR. S. PARKES CADMAN

By the Rt. Rev. William T. Manning

Bishop of New York

It is peculiarly appropriate that Bishop Manning should contribute to the Journal of Calendar Reform a summary of the calendar reform activities of the late Dr. S. Parkes Cadman. For under the forceful leadership of Bishop Manning, the subject of calendar reform was formally presented to the Episcopal Convention in Atlantic City in 1934, resulting in the adoption of a comprehensive resolution by both the House of Bishops and the House of Deputies. This action preceded by nearly 18 months the formal approval of calendar reform by the Anglican Church, made public in an address by the Archbishop of Canterbury in the House of Lords on March 4, 1936.

ON July 12th, international calendar reform suffered the loss of one of its foremost leaders among the clergy of the world, Dr. S. Parkes Cadman, honorary moderator of the Congressional Church of America, president of the Federal Council of Churches, chairman of the American Section of the Universal Christian Council and a president of the Council itself.

For more than three years Dr. Cadman had been a member of the Advisory Committee of The World Calendar Association, a member of the Standing Committee on Calendar Reform of the Universal Christian Council, and an active advocate of calendar reform in international forums.

Dr. Cadman was born in England in 1864 and entered the Methodist ministry there before coming to the United States in 1890. His first charge in this country was at Milbrook, N. Y. He came to New York City in 1895, as pastor of the Metropolitan Temple, moving six years later to the Central Congregational Church in Brooklyn, of which he was still the active pastor at the time of his death. He was often compared to Henry Ward Beecher as a preacher, but the radio gave Dr. Cadman a vast audience which Beecher could not reach in his day.

From 1924 to 1928, Dr. Cadman was president of the Federal Council of Churches, and international recognition of his leadership of the American churches came with his election in 1925 as head of the American Section of the Stockholm Conference on Life and Work. From then, up to his death, he devoted a large amount of his time to international activities, going abroad at frequent intervals as a spokesman for the Protestant churches of America. He was the author of many books, the last of which was published within a few months of his death.

Calendar reform came to Dr. Cadman's attention with the early activities of the League of Nations which sought to bring about an agreement

on this subject between religious and civil authorities. From the beginning, he was a consistent and devoted advocate of revision, supporting the League of Nations' program for securing a definite commitment from all the church bodies throughout the world.

It was his recommendation that was largely influential in inducing the Universal Christian Council, in 1932, to undertake a four-year study of calendar reform. This study progressed until in 1935, the world churches were ready to appoint a standing committee "authorized to communicate with governments and with any influential groups or personages for the purpose of advancing the cause of calendar reform." The membership of this committee included besides Dr. Cadman: the Bishop of Chichester, representing the Archbishop of Canterbury; the Archbishop Germanos, representing the Ecumenical Patriarch of the Eastern Orthodox Church; and Bishop Ammundsen of Denmark, representing European Protestant groups. Despite some changes, it remains practically the same to date.

A year after the formation of this committee under Dr. Cadman's leadership, the American churches completed a study of calendar reform, bringing matters to the point where he could address a memorial to the President of the United States and the Secretary of State, signed by a special committee of the American churches, explaining officially their attitude. "The Universal Christian Council," he explained in this document, "has been engaged in a formal study of calendar reform for the past four years. The undersigned have been appointed by the American Section to make this formal report to the American government stating the favorable attitude of our churches toward the international proposals for reform of the calendar. . . . The calendar has a religious meaning, and a revised calendar will inevitably have an effect in unifying and stabilizing church calendars of all the great communions. The significance of the movement, in its bearing on church unity, is what has won for it the attention and support of church leaders."

Dr. Cadman's far-seeing, vigorous and tactful leadership was visible throughout the gradual development of the calendar reform movement in the vast arena of church government. A firm foundation for this development was laid at a meeting in Eisenach in 1929 of the Continuation Committee of the World Conference for Life and Work. It was agreed on that occasion that the churches should, when the time came, "take part in the international inquiry into these questions." Three years later, Dr. Cadman's proposal for a formal study of calendar reform by the churches was accepted by the Universal Christian Council at its Geneva meeting. This study was immediately begun, and its results were reviewed by world church leaders at meetings in Novi Sad in 1933, in Fano in 1934, and in Chamby in 1935.

At the time of his death, Dr. Cadman was preparing for the final

presentation of the conclusions of the world churches at a meeting in Switzerland in August. He had carefully studied the proposed resolutions on the subject, particularly with a view to their most effective presentation later to the Council of the League of Nations. The program which he advocated was fully carried out at the Chamby meeting, in spite of the fact that death prevented his giving it the personal attention and advocacy which he had planned to do. He believed that calendar reform would receive the world-wide and official approval of all the churches—both Protestant and Catholic. The vote at Chamby in August of this year completely fulfilled this expectation.

> "A reform of the calendar and the stabilization of Easter would, if carried through, receive the support of the overwhelming majority of the Churches, providing it is based upon the perpetual twelve month equal-quarter plan proposed by the League of Nations.
>
> "Therefore, be it resolved that the Universal Christian Council instructs its Standing Committee on Calendar Reform, to notify the Secretary General of the League of Nations concerning the above report and to secure the most effective presentation of this action of the Churches at the forthcoming world conference on Calendar Reform and the stabilization of Easter and finally,
>
> "That this Council asks the Churches to inform their respective Governments of this action and of their views with regard to the desirability of adopting the new calendar."

Dr. Cadman was largely influential in calling the attention of the world to the earnest leadership which the Eastern Orthodox Church was prepared to give to the cause of calendar reform. His hopes and predictions for the future of this cause were fulfilled this year when the Archbishop of Canterbury, speaking officially on the floor of the British House of Lords, threw the full support of the Church of England on the side of calendar revision in the significant words: "I have found it impossible to resist the plea for reform in this matter, which comes, I think it may be said, with practical unanimity from the representatives of all the great organizations of trade, industry and commerce throughout the civilized world."

Dr. Cadman had hoped to live to see the fruits of his labors for calendar reform become a practical and enacted fact. He joined with the Archbishop of Canterbury in expressing a fervent belief that it would be a real misfortune if this matter were allowed to drift on to a point where it could not be consummated in 1939. At least as far as the great church communions were concerned, he lived to see all the necessary preparations completed so that no obstacle on their part can prevent the civil authorities of the nations from carrying out the program of the League of Nations for legislative enactment at that time.

LA QUESTION DU CALENDRIER

A Biographical Note and Three Reviews by American Authorities

As a frontispiece to this issue of the JOURNAL, there appears a recent photographic study of the Abbé Chauve-Bertrand of Nevers, France, whose book on calendar reform has just been published in Paris under the title "La Question de Paques et du Calendrier." The book, bound in the French manner in paper, sells in Paris at 16.50 francs. A limited supply has been imported by the JOURNAL OF CALENDAR REFORM for its readers. These copies are on sale for $1 each, postpaid.

CHAUVE-BERTRAND'S BACKGROUND AND PERSONALITY

By PAUL-LOUIS HERVIER

French Journalist and Author, Secretary of the French Bureau of Studies on Calendar Reform

WITHIN the past few weeks there has appeared in Paris a 256-page book on the subject of calendar reform, from the pen of the Abbé Chauve-Bertrand of Nevers. The title is "La Question de Paques et du Calendrier," the publisher is the notable house of "Les Oeuvres Francaises." The book was published with the full authority of the Church, as testified not only by the customary *Nihil Obstat* and *Imprimatur*, but also by a comprehensive preface from the pen of the famous Abbé Cabrol of England, venerable author of twenty standard works on the liturgy and editor of a Latin-English Missal that is used in many Roman Catholic churches in England and America.

Instant recognition of the importance of the book came from reviewers both of the clerical and lay press. Although the author modestly described his work as a "revision" or "second edition" of a somewhat smaller book which appeared in 1920, it was immediately recognized that his earlier book had been completely re-written and that the present volume was the completest and most scholarly treatment of its subject which has ever appeared in the French language.

The Abbé Chauve-Bertrand has been a student of calendar problems for more than a quarter century. He commenced his studies of the subject as early as 1901, while he was a member of the Benedictine community in Ligugé, Belgium. During the six years which he spent there, he gathered a vast amount of research material which he planned to embody in an exhaustive work on the political and religious evolution of human society. One of the projected chapters of this work was to deal with the evolution of the calendar and the by-play of civil and religious influences which had affected the world's systems of time measurement.

In 1907, he went to Spain, to become Secretary and collaborator of the famous Father Guepin, who had just returned from Rome, where—in co-operation with Abbé Cabrol—he presented to a Benedictine Congress a

plan for revision of the monastic breviary. In the following year, Father Guepin published a monograph which resulted in 1911 in the promulgation of a Papal Bull on liturgical reforms of the breviary, the missal and the general calendar of the Church. (In relation to the calendar, this edict dealt only with the rearrangement of certain secondary feasts.)

Father Chauve-Bertrand, while working with Dom Guepin, conceived the idea of pushing still further into the field of the church calendar. He began to envisage the possibility of promoting a general interest in the stabilization of the movable feasts and perhaps a revision of the Gregorian calendar. He was assured that the Vatican approved of his plans.

With this support and encouragement, he ventured to publish his first monograph, in a group of four prominent Catholic reviews. His articles attracted widespread attention and resulted in an extensive correspondence which has continued ever since.

Meanwhile there had developed an active international interest among European statesmen and politicians in the subject of general calendar reform. This interest seems to have been aroused largely as a result of the discussions among Catholic scholars of the problems of the church calendar. The two movements for revision went on side by side, but it does not appear to have occurred to anybody that they were not separate and distinct matters, at least not until a group of international agencies summoned the Congress of Liege for the consideration of calendar reform, in 1914. The Church was invited to attend and participate in the deliberations and the Abbé Chauve-Bertrand was among the forty-odd delegates.

He had already begun the preparation of a book embodying the results and conclusions of his researches, and the Liege meeting prompted him to push it through to immediate completion. It was, in fact, ready for the press by midsummer of 1914, when the World War suddenly called every loyal Frenchman to the colors. The Abbé was in military service until 1919, when he was honorably discharged and returned to his priestly duties in his native diocese of Nevers. The book which he had written five years before was still in manuscript, and one of his first cares was to submit it to a Paris publisher. A year later it came from the press, under the title "La question du calendrier."

The book won the attention of Professor Bigourdan, director of the Paris Astronomical Observatory, who promptly invited its author to attend the Congress of the International Astronomical Union in Rome, at which the subject of calendar reform was to be discussed and the attitude of astronomical leaders defined. As an expert on the calendar, Chauve-Bertrand was made a member of the Union's Commission on the Calendar, and later was chosen secretary of this Commission and prepared its report, which became the basis on which the League of Nations first took up the subject of calendar revision. The Chauve-Bertrand report, indeed, has

become a fundamental part of calendar history, having been the first document circulated on this subject by the League of Nations to governments and religious authorities.

Between the years 1912 and 1928, the Abbé Chauve-Bertrand published more than 20 articles on the subject of calendar reform in the leading Catholic reviews of France, Belgium and Spain. The titles illustrate the range and completeness of his studies: Stabilization of Easter, Plans for Revising the Gregorian Calendar, Future Reform of Our Calendar System, Changing the Civil Calendar, The Year's Beginning, Peace and Calendar Reform, Are We Going to Change the Calendar?, Elements of Time Measurement, Farewell to the Julian Calendar, Practical Calendar Progress, Shall We Have a New Calendar?, Triumph of the Gregorian System, Story of the Eras, Catholics and Calendar Reform, A Plan for a New Calendar, Various Kinds of Years, The Cycle of the Weeks, Turkey and the Calendar, League of Nations Plan for New Calendar, etc.

Since 1928, the Abbé's contributions to periodical literature have been less frequent, although library indexes record five important contributions published in the Catholic Almanac, La Vie Catholique and La Croix.

Meanwhile his 1920 book, after a re-printing, was no longer available for those seeking an authoritative work on calendar reform. Moreover, there had been important developments since that time which the author felt should be chronicled. About a year ago he began a complete re-writing of the text, and the result was a practically new work.

A characteristic of the book is that it takes up the subject in all its aspects—historic, scientific, social, astronomical and religious. The author combines all these factors in a delightfully convincing synthesis.

Almost simultaneously with the appearance of his book, the Abbé Chauve-Bertrand was honored with election as Vice-President of the International Committee on Calendar Reform at Geneva, a distinction which he shares with Lord Desborough of England and the Archbishop Germanos of the Eastern Orthodox Church.

It is a pleasure for the writer of this brief biographical notice to record the delightful personal association which he, as secretary of the Bureau d'Etudes pour la Reforme du Calendrier, has had with the Abbé Chauve-Bertrand. The distinguished churchman and scholar is a man of great personal magnetism, deep sincerity and warm sympathy.

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A CHURCHMAN'S REVIEW OF THE BOOK

By Edward S. Schwegler, D.D.

Priest of the Roman Catholic Diocese of Buffalo

The Estimable Abbé Chauve-Bertrand, who has long been known as a student of questions appertaining to the history and improvement of the calendar, has written a book which is without doubt the most satisfactory and complete work of its kind in any modern language.

It treats, first, of the origin of the calendar, taking in turn the history of the Chaldaic or Babylonian, the Hebrew, the Egyptian, the Coptic, the

Hindu, the Chinese, the Toltec, the Aztec, the Greek, the Arabian, the Mohammedan, the Turkish, the Roman, the Julian and the Gregorian calendars. There is then a sketch of the modern movement for calendar reform and an analytical consideration of various plans that have been advocated in the past few years. In a third lengthy section Father Chauve-Bertrand treats thoroughly all the elements of the calendar that might be in need of reform: the leap year rule, the wandering week, the beginning of the year, the number of months, the names of the months, the date of Easter, etc.

The bibliography at the end of the book gives some indication of the work's thoroughness. References go anywhere from Plutarch, Macrobius, Venerable Bede, Clavius, to Comte, Cotsworth, Duchesne, Eginitis, the League of Nations and the Journal of Calendar Reform.

The only recent English work comparable to the one under consideration is Alexander Philip's *The Calendar, Its History, Structure and Improvement* (Cambridge, 1921). And Father Chauve-Bertrand may well feel proud of the tribute which he received from Mr. Philip: "Your work is a masterpiece. . . If I had previously known about it, I would not have written my book."

By way of conclusion the author devotes a few remarks to his own opinion as to how the calendar should be reformed; and there can be no doubt of his conviction that the 12-month plan, widely known now in many countries as The World Calendar, is the best solution of the whole problem. He says:

"A reform of the calendar cannot be a real reform unless it makes the year unchangeable. To do this, we cannot avoid the necessity of breaking the absolute continuity of the weekly cycle by omitting a day in ordinary years and two days in leap years.

"Then, we must choose between the 12-month plan, with equal quarters of 91 days each, and the 13-month plan, with months of 28 days each. . . It can no longer be doubted that the latter, which once had many proponents, is declining in popularity. The plan which retains the 12 months is prevailing more and more; during the last few years it has attracted a most impressive majority of followers and seems called to be the elect of heaven. . ."

Looking towards the future, the author then expresses some profound considerations that will appeal especially to the clerical student:

"Amid the misgivings caused more or less on all sides by the trend of current events and by the fear of even graver developments, it would be splendid to see the representatives of all the countries of the world meet at Geneva and adopt a single universal measure of time—the seed, mayhap, of future agreements on other points.

"And it would be equally splendid and consoling to behold the Christian Churches reunited in a new Council of Nice, reaffirming their agreement

as to the sacred day of Easter and making statements that would lead to greater Church Unity.

"And finally, another notable result which one would like to see ensue from the universal adoption of a fixed calendar would be the extension of Sunday as a day of rest to all the peoples of the earth."

Here and there the student may be inclined to disagree with the author, although the latter can always quote good authority for what he says. A case in point is the oft-repeated story of the Emperor Augustus "stealing" a day from February and adding it to August, a story which, by all indications, is more fable than fact.

If this work should appear in still another edition, one might suggest a few additions that would make it even more valuable. There could be, for instance, an extensive explanation of all the astronomical facts that lie behind the history of the calendar. These facts are at times very puzzling, and they tend to scare people away from a consideration of calendar reform. There might also be tables for the ascertaining of the Easter date and for the calculating of the weekdays corresponding to various dates in different years of the present Gregorian calendar. If reform comes, such tables would always have historical value; and if it does not come—*quod Deus avertat!*—the tables would continue to be of very practical service to readers of the book.

This work, while covering its subject from all angles, has a special significance for Catholic students of calendrical matters; for not only does it bear the *Imprimatur* of ecclesiastical authority, but it contains an important preface by the renowned liturgical scholar, Dom F. Cabrol, Abbot of St. Michael's, Farnborough, England.

The following statement of Dom Cabrol is of particular import: "When the time comes that the League of Nations, which has already studied this question, can show that there is universal agreement among all nations using the Gregorian calendar (about the advisability of reform) and that the proposed plan is scientifically better than the present calendar and meets with support on all sides, it is probable, not to say certain, that the Holy See would be disposed to say, in the words of Leo XIII, 'the introduction of such a reform would meet with proper consideration.' "

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A MASTERLY VOLUME

By P. W. Wilson

Well-known Book Reviewer for the New York Times

In Reading this modest but masterly book, we have been impressed by the Abbé's detachment from all partialities, his serene reliance on the ascertained conclusions of science and scholarship, and his full recognition that he is dealing with an instrumentality which is necessary to the community

as a whole, secular as well as sacred. Our one regret is that the volume should not be available in more languages than one. A translation into English would be of great value—not only as an excellent guide to knowledge of the calendar, but as an example of that tranquillity amid turbulence which is the heritage of those whose times are in tune with the eternities.

About the Gallic intellect at its best, there is an especial and irresistible excellence. It may be summed up in the single word "lucidity"—a beautiful word meaning the clarity that shines like a crystal in its clean-cut certitude.

It is an exquisite and ultimate lucidity that adorns the pages of this brief yet comprehensive treatise on the calendar. Libraries of source material have been absorbed, yet without bewildering a scholarly mind. The Abbé Chauve-Bertrand surveys a vast and perplexing field of research. But he always sees the point, and only those who have attempted the task which the Abbé has achieved can appreciate what such an achievement involves.

The calendar has been, on the whole, a contribution by faith to the life of man. The measurement of time was regarded as a mysticism within mathematics and it is by the name of a Pope that our Gregorian calendar is known. In these pages, this great tradition is revealed in the perspective of universal history. It is a very gracefully proportioned map that the Abbé has drawn. But it embraces the world.

The success of the book is due to arrangement. First, we have a parade of the Calendars. Egyptian, Chaldean, Hebrew, Greek, Roman, Chinese, Hindu, Coptic, Mexican, they pass before us in solemn processional, not in the dull robes of pedantry, but as the actual instruments of civilization. The record is factual and no words are wasted. The pageant of time is, on that account, more impressive.

Out of the review there emerges what was adopted as the Roman Calendar—Julian, Augustan and Gregorian. All the other systems of measuring time recede into the background. It is on our modern Calendar that the Abbé concentrates his attention. The field is narrowed into the main highway of human progress. Much is alleged against western institutions. But the western calendar is the only calendar that can ever be universal.

The treatise sweeps forward into the future. The Abbé refuses the assumption that the Gregorian calendar, despite its superb merits, is a chronometrical finality. He sets forth a truly astonishing catalogue of proposals for improving the calendar and thus demonstrates that active minds in many countries have been at work, often independently, on a fascinating problem.

As the Gregorian calendar has proved to be, compared with others, a survival of the fittest, so among suggested reforms of the Gregorian calendar, it is the fittest that will inevitably survive. The Abbé hardly needs to specify what that choice must be. His references to The World

Calendar are corollary to his entire presentation of a majestic panorama.

Our only criticism on the book is that, as we think, undue emphasis is laid in the title on the problem of Easter. We realize that this is a problem of especial interest to the Abbé because of its ecclesiastical significance. We agree also that the allusion to Lord Desborough's services in advocating a fixed Easter is well deserved by that patient and diplomatic pioneer. But important as the date of Easter undoubtedly is, this volume is not limited to that subject.

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CLARIFYING THE WORLD-WIDE VIEWPOINT

By H. Parker Willis
Professor of Banking, Columbia University

Within the past few years there has been an increase in growth of interest among business men, particularly among bankers, with regard to the subject of calendar reform or improvement. As yet, it cannot be said that opinion is finally crystallized in favor of a distinct plan, and one reason for the failure to make measurable progress in the direction of definiteness has been the doubts that have been entertained by many with regard to the obstacles that might stand in the way of a change which would inevitably call for the cooperation of ecclesiastical authorities and for their ratification in the determination of the details. In a very real and practical way, therefore, the ascertainment of the attitude of the Church in its various branches toward an innovation which would so radically alter the Church calender as well as secular calendar arrangements is of direct significance in the field of finance and business, as well as in that of statistics, especially those of commercial importance. For this reason, if for no other, any careful piece of work which helps to clarify the condition of opinion generally with regard to calendar reform has a broad bearing and an interest to the business world that might otherwise be neglected. The lay reader, therefore, will receive as of corresponding value this volume by Abbé Chauve-Bertrand, in that it makes plainer than heretofore the precise position of the Catholic Church in regard to proposed changes in the organization of the calendar and thus makes fresh contribution to the task of gauging and estimating the attitude of the various important elements in the study of the calendar, whose ideas must be fully appraised and reckoned with as a preliminary to actual progress.

In order to clarify the ecclesiastical attitude on this subject, the author makes a historical survey of the evolution of the present calendar from the beginning of history; this he embodies in the first chapter of his work. Later on in the book, he gives a chronological résumé of the history of the calendar, running back to the year 4241 B.C. and mentioning the principal dates at which most important calendar changes have been introduced. Chapter II is then devoted to a review of the actual proposals for reform

that have from time to time made their appearance. The volume terminates with a brief concluding chapter in which the author takes account of some comments and criticisms that have been offered with regard to the first edition of the book (published in the year 1920). In this concluding comment Abbé Chauve-Bertrand remarks that "One would not be inclined to consider very seriously the various projects which have had for their purpose the mere equalization of the length of the months, nor would one give any greater attention to those that suggest the establishment of quarter years, each containing two months of 28 days each and one of 35 days, nor can he take very seriously the idea of a 53rd week of the year which, at stated periods, is introduced with the inevitable result of breaking the regular rotation of the weeks. Reform will not be truly serious unless it is able to establish a perpetual calendar. In order to do this, there is no escaping the necessity of breaking, to the extent of one ordinary day in each year, and to the extent of two days in every twelfth year, the absolute continuity of the cycle of weeks."

"Accordingly," adds Abbé Chauve-Bertrand, "it will be necessary as the basis of any reform, to choose between the plan of having 12 months divided into equal quarters of 91 days each, and on the other hand the idea of a 13-month year with 28 days each month. Undoubtedly, the proposal of a 13-month year, which has had a considerable number of supporters, would be a backward step. The plan of preserving the 12-month year, which has always had priority, becomes more and more obvious as a necessity, and at the present time it draws to itself an imposing majority of supporters."

This conclusion is endorsed by the writer of the Preface to this volume, the distinguished Abbé Cabrol of England. He, after noting that the question of the calendar has for generations been a problem of importance to the whole world, remarks that the work of Abbé Chauve-Bertrand is a valuable summary of all the arguments pro and con which have made their appearance, and is therefore recommended to all Catholics who are interested in the question. "It is, of course, necessary," he says, "to inquire the thought of the Holy See on the subject, since all writers about calendar reform will understand that no proposal is likely to succeed unless it can call to its aid the support of the Catholic Church." He calls attention to the fact that Abbé Chauve-Bertrand's historical research has developed two or three definite expressions—the one from the time of Pope Leo XIII, and a much more recent expression of 1924. This is a subject which Abbé Cabrol is eminently qualified to discuss, since he was himself the head of a mission which went to Rome in 1935 to inquire into the attitude of the Vatican on calendar reform. He is himself an ardent supporter of calendar revision and the report of the mission indicated that opinion at Rome was definitely in favor of the proposed 12-month equal-quarter calendar.

It is undoubtedly true that the clerical authority for the arrangement

of the calendar is likely to maintain itself, supported as it is by church tradition and decisions of the past. Reform must therefore enlist in its behalf authority similar to that which supported the Gregorian revision. The value of Abbé Chauve-Bertrand's work is thus found in the fact that he has assembled through careful calendar research the ecclesiastical basis for present calendar practices. He has moreover shown exactly at what point the validity of existing methods ceases to find support from the Church and depends entirely upon secular practice and reasoning. His preference for the 12-month calendar as the result of his own researches is thereby rendered the more significant and valuable.

OBITUARY NOTES

PROF. PAUL STROOBANT, leading astronomer of Belgium, head of the Belgian National Committee on Calendar Reform, and member of the Foreign Advisory Committee of The World Calendar Association, died in Brussels on July 15. He had been for nearly a generation the director of the National Astronomical Observatory in Brussels, professor of Astronomy at the University of Brussels and chairman of the Science Branch of the Royal Academy of Belgium. His interest in astronomy dated from his early youth: at the age of 14 he began observations of comets which led to the publication of his first scientific monograph when he was only 16. Three years later he published a work on the satellite of Venus, based on studies he had made at the University of Brussels. He was only 22 when he was appointed to the faculty of the College of France, attached to the Paris Observatory. He returned to Belgium before he was 30, and devoted the remaining years of his life to his work there. His interest in calendar reform was of long standing, and he had attended every important international conference on this subject since 1910, being one of the leading advocates of the 12-month equal-quarter plan.

DR. JUAN CARULLO, one of Argentina's leading bankers and a member of the Comite Argentino del Calendario Mundial, passed away recently at his home in Mendoza. Dr. Carullo, an ardent advocate of calendar reform in Latin America, was responsible in no small degree for the successful effort made by the Argentine Committee in bringing the merits of The World Calendar to the Argentine people.

REV. DR. EDMUND B. CHAFFEE, director of the Labor Temple, New York, and a social worker of national reputation, died on September 15. A member of The World Calendar Association for the past four years he was able as editor of the *Presbyterian Tribune* to interest a large religious audience.

WALTER H. SEELY, former editor of *Success Magazine*, died in Philadelphia on June 23rd. Formerly an advocate of the 13-month plan, he became a member of The World Calendar Association, and was instrumental in bringing this plan before the reading public.

OTHER deaths among the membership of The World Calendar Association during the past few months included: John Hays Hammond, mining engineer; Senator Duncan U. Fletcher, United States Senator from Florida; James M. Beck, former member of the House of Representatives; Joseph W. Byrns, Speaker of the House of Representatives; Randolph Perkins, member of the House of Representatives; Dr. Walter Laidlaw, Secretary of the New York Federation of Churches; William Butterworth, chairman of the Board of Directors of Deere and Company; Marlen E. Pew, editor of *Editor and Publisher;* Frank C. Munson, president of the Munson Steamship Company.

SWISS LAW AND NEW CALENDAR

A Study by the Swiss Committee for Calendar Reform of changes in Swiss internal law, required when revised calendar is adopted.

(Abstracted from the German by C. D. Morris)

IN 1930, the Departments of the Interior of the Swiss government met at Berne to discuss the question of calendar reform and the Swiss Committee for Calendar Reform was organized. Extended and continuous inquiries by this Committee resulted in a large majority of all important Swiss organizations and public leaders giving their assent to the necessary arrangements for introducing the reform in Switzerland—naturally in conjunction with other principal nations.

There can be no doubt, therefore, that the proposed perpetual calendar (the proposal which retains the 12-month division of the year) will be sanctioned and approved by the Swiss people.

Although the League of Nations' international conference of 1931 did not push the calendar reform proposal to a conclusion, there can be no doubt that the plan for a revision of the calendar will shortly be brought forward again, with a view to enactment.

For this reason, it has seemed desirable to the Swiss Committee to proceed with a study of the internal laws which will require modification or change, in order to comply with the new calendar, and what the necessary modifications will be. Therefore, the Committee has referred the principal questions which will arise to the foremost Swiss authorities for their legal opinions. Their answers are published in this report.

The statements herewith made, cover the most important points on which questions are likely to arise. These authoritative statements are definite proof of the need for drawing up definite recommendations and regulations in connection with the introduction of the new perpetual calendar. The advance arrangements, legal and otherwise, must be clear and definite, so that leases, contracts and agreements made under the old calendar system will continue without interruption or controversy under the new system. Certain small disarrangements and innovations must be anticipated and fully provided for.

CONSTITUTIONAL PROBLEMS

Question No. 1. What is the legal procedure to be followed in the introduction of a reformed calendar in Switzerland? Answer by Prof. Dr. D. Schindler of Zurich:

"The competence of the Confederation in the matter of introducing a new calendar comes under Article 40 of the Constitution, which gives the central government jurisdiction over weights and measures. The

words *weights and measures* are defined as including all those computations which are necessary for the uniform and orderly regulation of daily life, and of economic and technical intercourse. This definitely includes measures of time (Cf. Burckhardt's *Kommentar der Schweiz. Bundesverfassung*, 3d Edition, pp. 341-2), as well as the measurement of time—that is, the calculation of hours and days, and anything else embraced in the term *chronology*.

"There is another question of competence, however, which arises. The new calendar will undoubtedly be introduced on the basis of an international agreement, expressed in a treaty. Now, it is generally accepted that the federal government, without regard to the constitutional separation of power between the Confederation and the cantons, may conclude an international treaty on any subject. Moreover, it is generally accepted that the federal government may take the necessary measures to carry out the provisions of such a treaty. Naturally this covers the signing of a treaty between states regarding the introduction of a new calendar.

"There is almost no doubt that the Constitution of the Federation permits the signing of such a treaty. (Cf. *Constitution*, Article 85, Section 5). But if any doubt exists, the question can be put to a facultative referendum, under Article 89, Paragraph 3, of the Constitution.

"The effect which the execution of the calendar reform treaties will have on existing Swiss legislation depends of course on whether the terms of the treaty are immediately applicable. New laws will be necessary to remove contradictions, and the final correction of existing laws may be only solved through experience with the new calendar. But it would be to the interest of all concerned that everything possible be done to amend existing legislation in a formal manner, so that it may be in complete harmony with the new situation."

CIVIL CODE CHANGES

Question No. 2. How far will the provisions of the Swiss Civil Code become inapplicable under the new calendar and what changes must be made? Answer by Prof. Dr. Fritzsche of Zurich:

"Examination of the laws of contracts—for example, with reference to the time allotted for fulfillment of obligations, wages, rents, employment, etc.—shows that these require certain definite changes with the introduction of a perpetual calendar. For instance, the end of a month never falls on a Sunday under the new calendar, and certain passages in the law (see Law of Obligations, Section 77, numbers 2-3) providing for this contingency are no longer necessary. The old provisions for legal holidays will require examination and revision. The labor legislation now in force provides that wages of workers must be paid at intervals no greater than two weeks, with the result that these pay periods never

coincide with the entire or half of the calendar month. The regularity of the new calendar suggests that each month may contain two periods for payment; it is evident that this would greatly simplify the keeping of accounts, payrolls, records and statistics. . . .

"The new calendar provides for a weekly period of eight days at the end of each year (and similarly at the end of the half-year in leap years). The present Swiss law dealing with the weekly rest period visualizes only the hitherto existing week of seven days. It should be amended to fit these exceptional cases, as any conflict with the existing rest-day regulations should be avoided. . . .

"It has been proposed by some exponents of calendar reform that the Year-End Day (Sylvester) at the end of December and the Leap-Year Day at the end of June quadrennially, should be made international holidays. This would be most unwelcome in large districts of Switzerland, but obviously the proposals for such holidays are optional and not a proper part of the framework of calendar reform.

"The Civil Code deals at length with questions of time as related to legal process, but calendar reform should not offer any special difficulties in this respect. However, whatever questions arise should be simplified; at all times simplification of time problems should be insisted upon. This applies also to the calendrical aspects of the cantonal civic code.

"To summarize: no particular difficulties need be expected from the standpoint of the present Swiss Code with the introduction of a perpetual calendar of 12 months. In fact, some simplifications will be introduced, which in the aggregate will be important and desirable, not only from a practical viewpoint, but also in their legal and procedural connection."

PRIVATE LAW

Question No. 3. Will the proposed reform of the calendar have any effect on the codes of private law and citizenship law? Answer by Dr. Url. Stampa, Director of the Citizenship Bureau of the Swiss Confederation, Berne:

"Certainly no adverse effect. I can say without hesitation that no one need suspect any *prejudice* in the new arrangement of the calendar. The advantages which it brings to civil life can also be shared by the code of laws which regulate the rights and duties of citizens. The recording and authentication of dates, as in our vital statistics, will be simplified, and it will not suffer at all in the transitional stage. This will also be true in regard to the whole structure of private law and contractual law."

BANKING

Question No. 4. How will the revision of the calendar affect banking laws? Answer by Dr. Hegetschweiler, adviser in international law to

the Swiss Credit Institution, Zurich, and a well-known authority on this subject:

"Between the old calendar and the new, there is a maximum difference of two days between the comparative dates. This difference is not a matter of great importance to the banking world, but it must be clarified in legislation so that there can be no incertitude as to the meanings of contracts and obligations which carry through the transitional period.

"For instance, there are many operations which start at the beginning of a month and expire at the end of a month. In case a transaction is to expire at the end of February under the old calendar, the question arises: does it expire on February 28 or 30, under the new calendar? The new calendar does not contain the dates March 31, May 31, August 31: definite legislation must provide that the dates of March 30, May 30 and August 30 should be substituted.

"Certain other questions will arise around the new dates of February 29, February 30 and April 31, as well as the dates designated as *Year-End Day* and *Leap-Year Day*. These questions must be studied and definitely met in the transitional legislation."

INSURANCE LAW

Question No. 5. How will the revision of the calendar affect insurance laws? Answer by Dr. Müller, counsel for the Swiss insurance companies:

"It can be said with emphasis that the introduction of the proposed perpetual calendar will not cause any special difficulties. This is true for the entire Swiss civil code, the laws of contract, the insurance laws of 1908 and the legal remissions and ordinances of the Confederation. The periods of time, which are known as 'Fristen' in the law, are stipulated entirely on the basis of days, weeks, months or years. Some of the provisions of Article 77 of the *Law of Obligations* or contracts will lose their present importance, because they apply mainly to the irregularities and changeabilities of the old calendar. But in general the legal problems which arise in insurance matters can be easily dealt with, under the new calendar,—such as, whether an event took place a day earlier or a day late, whether the burning of a building or the loss of a ship took place on a day covered by the insurance contract, or whether the date can be fixed for any given event in which an insured person is involved."

In conclusion, the Swiss Committee desires to state that all the authorities agree in condemning proposals for a 13-month calendar. It is clear that such a drastic change would be followed by great difficulty and that many provisions of Swiss law would be inapplicable to such a system.

Prof. Dr. E. Marchand, *President*
E. Hofmeister, *Vice-President*

Zurich, March 26, 1936.

U. S. OFFICIAL STATEMENT

By Elisabeth Achelis

President, The World Calendar Association

FROM Washington comes a government statement on calendar reform, strongly urging revision of the calendar and advocating an international conference to discuss the matter with a view toward obtaining definite enactment of the proposed change.

The statement comes from the Central Statistical Board, a coordinating group of officials representing all departments of the Government and operating under a Cabinet Committee—composed of the Secretary of the Treasury, the Secretary of Agriculture, the Secretary of Commerce and the Secretary of Labor.

The subject of calendar reform came before this Board through a request from the State Department for guidance in international discussions of calendar reform. The Central Statistical Board was asked to make a study of the questions involved and to submit a report which could be used in formulating the policy of the United States Government.

Studies by the Central Statistical Board have been going on for more than a year, and have now resulted in a definitive report to the State Department. The report is entirely favorable to the general idea of calendar reform. It recommends (1) that the United States send representatives to any meeting called by the League of Nations on the subject; and (2) that the United States support proposals for the calling of an international convention on calendar reform.

The report emphasizes "the increasing advocacy of calendar reform in this country" and the "widespread support for a special international convention to discuss the matter thoroughly." It explains that "the need for the establishment of a perpetual calendar is now agreed upon by a very large number of business interests, and is sympathetically viewed by the agencies of the Federal Government dealing with statistics," and continues, "We would urge participation by this country in such an international convention," whose decision thereafter could be presented to the countries of the world for action and adoption.

The Central Statistical Board recognizes and is keenly appreciative of the studies and activities undertaken by the Commission for Communications and Transit of the League of Nations for calendar reform. At the same time the Board notes that the Commission, being chiefly concerned with transportation and communication matters, is not in a position to carry the reform to the actual stage of commitment, and

therefore suggests that the Commission should recommend to the League of Nations the calling of a special international convention.

The complete text of the report of the Central Statistical Board, together with the acknowledgment by the State Department, is published in a footnote below. It is an important document in the history of the world's progress toward a newer and better calendar.

It will be noted that the American declaration is similar in tenor to the official pronouncement made by the British Government last March in the course of the House of Lords debate led by Lord Merthyr, Lord Desborough and the Archbishop of Canterbury, all advocates of calendar revision. At that time, the spokesman for the British Government promised that the subject of calendar reform, whenever it came up for consideration at the League of Nations, would have "the most sympathetic and serious consideration of the representatives of His Majesty's Government."

The British statement was interpreted a few days later by Lord Desborough in The London Times. He said in part: "It would appear that the active opposition to reform was really opposition to the 13-month scheme, and that the allegations of public apathy on the question, although true of 1931, are much less true today. Such a subject as this cannot of course be expected to excite the passionate interest of the general public, but it is a fact that many responsible bodies have passed resolutions in favor of a moderate scheme of reform. It is satisfactory that the Government has promised that the question will have the most sympathetic and serious consideration of their representatives at Geneva. The movement for a general reform of the calendar has developed widely."

EDITOR'S NOTE: The Central Statistical Committee of the United States Government consists of: Daniel C. Roper, Secretary of Commerce; Frances Perkins, Secretary of Labor, (Chairman of the Central Statistical Committee); Henry Morgenthau, Jr., Secretary of the Treasury; and Henry A. Wallace, Secretary of Agriculture. Its subsidiary, the Central Statistical Board, includes the following; Stuart A. Rice, Chairman; Isador Lubin, Vice Chairman, Commissioner of Labor Statistics, Department of Labor; Oscar E. Kiessling, Chief Economist, Mineral Resources and Economics Division, Bureau of Mines; Mordecai Ezekiel, Economic Adviser to the Secretary of Agriculture; E. G. Draper, Assistant Secretary of Commerce; E. A. Goldenweiser, Director, Division of Research and Statistics, Board of Governors of the Federal Reserve System; George C. Haas, Director of Research and Statistics for the Treasury; E. Dana Durand, Commissioner, Tariff Commission; Corrington Gill, Assistant Administrator in charge of Research, Statistics and Finance of the Works Progress Administration; W. H. S. Stevens, Assistant Chief Economist, Economics Division, Federal Trade Commission; Leonard D. White, Commissioner, Civil Service Commission; Ernest M. Fisher, Director, Division of Economics and Statistics, Federal Housing Administration; and Frederick F. Stephan, Secretary-Treasurer, American Statistical Association.

The resolution on calendar reform of the Central Statistical Board is included in the following letter addressed to the Secretary of State, signed by Stuart A. Rice, Chairman:

"My dear Mr. Secretary: With further regard to our letter of March 8, 1935, on the subject of calendar reform and the answer thereto of March 18, 1935 (file WE:570.B5/45), signed for you by the Under Secretary, I am directed by the Central Statistical Board to inform you that we have had the several questions of calendar reform under further consideration. . . . The Central Statistical Board recently held a special meeting at which there were present representatives of the two chief associations interested in calendar reform, together with a number of representatives of Government departments and agencies and non-Government interests. . . . As a result of the discussion at this special meeting, the matter of calendar reform was given further consideration at the last regular meeting of the Board. I am directed to report to you several actions taken by that meeting. . . . The Central Statistical Board recognizes that the United States can take no action with regard to agenda items for the next meeting of the Commission on Communications and Transit of the League of Nations, which, we understand informally may be called into session this autumn. Nevertheless, we believe that the Department of State should be informed of the increasing advocacy of calendar reform in this country and of the

Thus England and the United States, the two great English-speaking nations, are in accord and ready to participate in the movement for a revision of the calendar through a specially-called international convention.

Other countries are aligning themselves with this movement. Germany's attitude, defined at Geneva in 1931, is further emphasized in recent unofficial declarations by the Ministry of the Interior. It is stated yet again in an article published in this issue of the *Journal of Calendar Reform* from the pen of Dr. Walter Simons, former Foreign Minister, Chief Justice and interim President of Germany. Dr. Simons urges the League of Nations to lose no time in the summoning of an international convention on calendar reform.

France, despite financial and political preoccupations, continues its interest in revision of the calendar, energetically advocated at Geneva by Senator Godart and the other French delegates to the International Labor Conference. Senator Godart has recently stated that he proposes to bring this subject up for consideration before the French Senate and to obtain a definite commitment from the French government, aligning it with England, Germany and the United States for immediate international action toward a convention at which a treaty would be drafted for the enactment of a new calendar. The traditional intellectual leadership of France on the European continent has brought forth, during the past few weeks, the most significant book on calendar reform yet published. It is written by the Abbé Chauve-Bertrand of Nevers, whose work carries a British endorsement in the preface by the venerable Catholic liturgical scholar, Abbot Cabrol of England.

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wide-spread support for a special international convention to discuss the matter thoroughly. . . . The need for the establishment of a perpetual calendar is now agreed upon by a very large number of business interests and is sympathetically viewed by the agencies of the Federal Government dealing with statistics. The Board believes that advocacy by the United States of either of the two chief plans of calendar reform at this time would be premature. It is the Board's further belief that the Commission on Communications and Transit of the League of Nations is not the proper body to decide the relative merits of the two chief plans, but that the Commission might be induced to report to the League a recommendation for the calling of an international convention. We would urge participation by this country in such an international convention called to decide upon one plan, which thereafter could be presented to the countries of the world for further action and possible adoption. . . . In the light of these beliefs, the Board has directed me to transmit to you the following resolution:

"BE IT RESOLVED that, if the subject of calendar reform is included as an agenda item for the next meeting of the Commission on Communications and Transit of the League of Nations, the Central Statistical Board hereby requests the Secretary of State to consider the advisability of sending representatives of the United States to such meeting, and BE IT FURTHER RESOLVED that the said Board requests the Secretary of State to consider the advisability of recommending that any delegate or delegates to such meeting be instructed to support a recommendation from the said Commission to the League of Nations that an international conference be called to discuss the several matters pertaining to calendar reform."

The formal acknowledgment of the State Department, addressed to Dr. Rice as Chairman of the Central Statistical Board, is as follows:

"My dear Mr. Rice: I have received your letter of August 4, 1936, informing me of the studies made by the Central Statistical Board on the subject of calendar reform and conveying to me the text of a resolution on the question recently adopted by the Board. . . . I note that the Board recommends in its resolution that the Government of the United States send representatives to the next meeting of the Commission on Communications and Transit of the League of Nations, if the subject of calendar reform is included in the agenda, and that such representatives be instructed to support the proposition that an international conference be called to discuss the several matters pertaining to calendar reform. . . . You may be assured that should an invitation to participate in a meeting of the Commission on Communications and Transit be received, the views of the Central Statistical Board will receive careful consideration by the Department of State.

"Sincerely yours, William Philips, Acting Secretary."

Italy, Spain, Holland and Belgium continue their long-standing interest in a new calendar and are ready to participate in the proposed international convention. With them are found also the Scandinavian governments, the Baltic nations and the Near Eastern group, including Greece, Yugoslavia and Turkey.

Switzerland was the first European state to advocate calendar reform, and it has legislated further on the subject than any other country in the world. The report of its 1931 calendar committee, recommending international enactment of a revised calendar, was officially approved before the Swiss Parliament and given a full vote of endorsement. Recently the same Swiss Committee has completed a survey of opinion by leading Swiss legal authorities on the internal legislation which will be necessary in connection with the change from the old to the new calendar.

Latin-American countries are a bloc in approving calendar reform. Leadership of this movement is lodged in the Chilean government. The Chilean delegates at Geneva, reinforced by other South American representatives, are earnestly pressing for League of Nations action. Mexico has considered the subject through a committee appointed by the Foreign Office and has obtained a complete agreement among all government departments in support of a revised calendar. Mexican leaders have recently expressed impatience at diplomatic delays and have suggested that the Mexican government is ready to call an international convention, to sit in Mexico City, if the League of Nations should not be in a position to act promptly.

In the Far East, the Japanese government has reiterated the clear stand which it took at the Geneva Conference of 1931.

The attitude of the churches, which was long a reason for international hesitation in calendar reform, has been greatly clarified during the past few months. At Chamby, Switzerland, in August of this year, the Universal Christian Council, central body of all non-Roman churches, concluded its four-year study of calendar revision and declared itself unhesitatingly and most emphatically for a new calendar. Members of this great ecclesiastical body include the Eastern Orthodox Church, the Church of England, and all the large Protestant Churches of Europe

EDITOR'S NOTE: Text of Resolution passed by the Universal Christian Council for Life and Work, Chamby, Switzerland, August 25, 1936; WHEREAS the Universal Christian Council at its Eisenach meeting in 1929 expressed its desire for a careful study of calendar reform and Easter Stabilization; and WHEREAS the Council in 1932 instituted an intensive study of these subjects by its Research Department; and WHEREAS these studies and reports from the Churches have shown that a reform of the calendar and the stabilization of Easter would, if carried through, receive the support of the overwhelming majority of the Churches, providing it is based upon the perpetual twelve-month equal-quarter plan proposed by the League of Nations:

THEREFORE, be it resolved that the Universal Christian Council instructs its Standing Committee on Calendar Reform, to notify the Secretary General of the League of Nations concerning the above report and to secure the most effective presentation of this action of the Churches at the forthcoming world conference on Calendar Reform and the stabilization of Easter and finally that this Council asks the Churches to inform their respective Governments of this action and of their views with regard to the desirability of adopting the new calendar.

and America. The viewpoint of the Vatican, too, is gradually being clarified—first, by the report of the Cabrol mission sent to Rome from England, and more recently, by the Abbé Chauve-Bertrand's book.

A wide development of interest in calendar reform is also noticed in other directions. Labor has spoken again and convincingly at the Geneva conference of the International Labor Office. Commercial bodies, following the long-standing leadership of the International Chamber of Commerce, have been active, and resolutions have recently come to the League of Nations from influential British groups, including the London Chamber of Commerce, the Association of British Chambers and the Congress of British Empire Chambers.

Scientific and learned associations which have manifested the widest public interest in the enactment include leading organizations of this kind, both in the United States and England.

The reasons which are behind this steadily growing international interest in the prompt enactment of a revised calendar were well expressed in the debate in the House of Lords last March and in the committee hearing before the International Labor Conference in June.

"If the calendar is reformed," said Lord Merthyr, "it would be of some advantage, direct or indirect, to every man, woman and child in the civilized world," and the Archbishop of Canterbury added: "I have found it impossible to resist the plea for reform in this matter which comes, I think it may be said, with practical unanimity from the representatives of all the great organizations of trade, industry and commerce."

The unanimous resolution passed by delegates of 47 nations at the Geneva Labor Conference declares: "It is a well-recognized fact that the present calendar is very unsatisfactory from economic, social and religious standpoints, and that recent studies, investigations and reports have shown a marked trend of opinion in favor of its revision."

Friends of the League of Nations have seen with keen appreciation the interest which the League has taken in calendar reform, because they view it as one of the subjects on which the League may well advance and strengthen, without friction or difficulty, the purpose of its Charter: *"To promote international cooperation and to achieve international peace and security."* Calendar reform, they point out, offers a timely and welcome opportunity for nations to come together without the handicap of national prejudice, political bias or special interest. The subject is one which aims at the common good and general welfare of mankind without discrimination or barrier. The reason and argument for calendar reform are based on the broad foundation that the natural orderliness and harmony of the universe dictate a corresponding symmetry and order in the system of our time-measurement, which is founded on the immutable movements of the earth and the sun. Here an application is found for the noteworthy statement of Dr. Robert Millikan, that the universe is

"of extraordinary and unexpected orderliness and of the wondrous beauty and harmony that go with order" and that there exists "an inter-relatedness, a unity and a oneness about the whole of nature." Or the similar statement of Calvin Coolidge that "the process of civilization consists of the discovery by men of the laws of the universe and of living in harmony with these laws."

A general agreement is being reached among all nations and authorities, as to the type of calendar revision which is required. It should be one in which the laws of the universe are applicable. The 13-month plan has been discarded and the 12-month, equal-quarter plan, known as The World Calendar, which responds more closely to the above-named attributes—law, order, harmony, balance, inter-relatedness, unity and oneness —is accepted as the approved method of revision.

The United States, in the report of the Central Statistical Board, has wisely drawn attention to the urgency of immediate international action for the calling of a treaty-drafting convention, if the world is to have the benefit of an improved calendar within a reasonable time. There are certain stated intervals at which the transition can be effected in an easy and natural way, when both the old and the new calendar coincide by beginning the year on the same day and date—Sunday, January 1, 1939. The same opportunity will not occur again until 1950—eleven years later. If, therefore, action by the League of Nations is not taken within the next few months, it becomes imperative for an individual government to take independent action by calling for the necessary international conference. The proper procedure will then be formulated for the operation of the new calendar in 1939. It is greatly hoped, however, that the League, fully aware of its opportunity, will not permit this chance for international cooperation and agreement to pass by and will do everything in its power to bring the new calendar to fulfillment without further delay.

In the House of Lords, Lord Desborough expressed the ardent wish "that this long-needed reform of the calendar and the stabilization of Easter may be introduced to the great advantage of the world in 1939." And, in the words of the Archbishop of Canterbury: "It would be a real misfortune if this matter were allowed to drift."

MATHEMATICAL DATE-FINDING

By JOHN L. ROBERTS

(From the *Annals of Mathematical Statistics*, March, 1936)

As an example of the intricate and complicated statistical processes which are necessary in connection with the present (Gregorian) calendar, this "simplified" outline prepared by Mr. Roberts for the leading periodical in the field of mathematical statistics, is interesting and instructive. He also shows very clearly the tremendous simplification that will come through The World Calendar.

IF WE wish to find the day of the week for any date, one way to solve the problem is to use a perpetual calendar. Another way to solve the problem is to calculate the day of the week by mathematical methods. In the past these mathematical methods have been so complicated that it has been much more convenient to use a perpetual calendar. This explains why some people have put themselves to the expense of buying perpetual calendars. The purpose of this article is to provide a mathematical method which is so simple that the entire calculation can be done mentally and which is as convenient as a perpetual calendar. In this article this mathematical method is applied to the Gregorian, Julian, and World Calendars. Since a great many records have been made using the Julian and Gregorian calendars, the adoption of The World Calendar would not completely eliminate the usefulness of applying the mathematical method to the historical calendars. The mathematical method also shows to what extent The World Calendar is a simplification; this is important because calendar reform is attracting world-wide attention.

In the theory of numbers occurs the expression,

$$a \equiv b \bmod p, \tag{1}$$

which is read a is congruent to b modulo p, and which means that the difference of a and b is divisible by p. Since p in this article is always equal to 7, it is convenient to represent (1) by

$$a \equiv b. \tag{2}$$

Assume m stands for any number which represents any monthday of any month. Assume w stands for any number which represents any day of the week. It is assumed that 7 stands for Sunday, 1 for Monday, 2 for Tuesday, etc. It is assumed that the constant c for any month is the value of m at the first Sunday in that month. Then (2) becomes

$$w \equiv m - c, \tag{3}$$

which enables us to find w if m is known provided the constant c is known for the month in question. Consequently, all we need to complete our theory is to discover a method of readily finding c for any possible month.

First, there will be discussed rules for finding c for any month of the Gregorian calendar in 1935. An inspection of the calendar shows that c

for December is equal to 1. Since November has 30 days, we can find *c* for it by adding 2, which is congruent to 30, to the *c* for December. Since the number of days in September, October, and November is 91, which is congruent to zero, the *c*'s for September and December have the same value. In like manner, since *c* for September is 1, the *c* for June is 2, and the *c* for March is 3.

We now have all the theory which is necessary to find *w* at any date in 1935. For example, suppose we wish to find *w* for April 17, and know that the *c* for December is 1. Then, by adding 2 we find that the *c* for March is 3. We are now in position easily to calculate that the *c* for April is 7. Applying (3) we find that *w* at April 17 is 3, which stands for Wednesday.

All that is necessary to complete our theory of the Gregorian calendar is to find rules for finding *c* for December of any possible year, because, if this is known, we can find *c* for any month in that year by the method used for 1935. It is convenient to represent the expression "*c* for December 1935" by "*C* for 1935." In like manner *C* for any calendar year means *c* for December of that year. Since *C* for 1935 is 1 and since the number of days in 1936 is 366, which is congruent to 2, subtracting this 2, we find *C* for 1936 is 6, because —1 is congruent to 6. Knowing *C* for 1936, we deduce that *C* for 1940, which is four years later, is 1, because 6 + 2 is congruent to 1; and that *C* for 1928 is 2 found by subtracting 4. The *C*'s for 1900, 1928, 1956, and 1984 are equal. Full centuries in order to be leap years must be divisible by 400. Since *C* for 1900 is 2, we find by adding 1 that *C* for 2000 is 3. Knowing *C* for 2000, we deduce by adding 2 that *C* for 2100 is 5. 1600, 2000, and 2400 have the same value of *C*. If it is assumed that the length of the tropical year is exactly 365.2425 days, we have all the theory which is necessary to find *C* for any possible year. Although this assumtion contains a small error, any further discussion of it would hardly be of any practical interest. The foregoing theory provides complete methods for finding *w* by means of a series of steps, which are so simple that the entire calculation can be done mentally. For example, suppose we wish to find *w* for November 29, 1888. Each of the *C*'s for 1800 and 1884 is 7. Therefore *C* for 1888 is 2, which is congruent to 7 + 2. Adding 2, *c*, for November of this year is 4. Applying (3), we find that *w* at November 29, 1888, is 4, which stands for Thursday. In order to calculate mentally *w* for any date of the Gregorian calendar, it is only necessary for me to remember the foregoing mathematical method and to remember I was born on November 29, 1888, a Thanksgiving Day.

Deplorable changes were made in the Julian calendar between 45 B.C. and 1 A.D. Also it was not until 325 A.D. that the use of the 7-day week became general throughout the Roman Empire, gradually supplanting the old division of the month into Calends, Nones, and Ides. Therefore, in order to save space, the application of our theory prior to 1 A.D. is left to the reader. Starting with this year it is only necessary to discover a rule for finding the *C*'s of the Julian calendar for the full centuries, because the rules of the Gregorian calendar apply to all other years. October 5, 1582, Old Style was the same day as October 15, 1582, New Style; the Gregorian calendar was born at this date. December 17, 1600, New Style was a Sunday, and was the same day as December 7, 1600, Old Style. Therefore, *C* for 1600, Old Style is 7. It is now a very simple matter to complete our theory of the Julian calendar. Since *C* for 1600 is 7, subtracting 1, *C* for 1500 is 6. 200, 900, and 1600 have the same value of *C*.

In the case of The World Calendar the *c*'s for the three months of each of the equal quarters can be found as follows. For the first month *c* is 1. Therefore, *c* for the second month is 5, which is congruent to 1 — 3. Subtracting 2 from this 5, we find that *c* for the third month is 3.

EDITOR'S NOTE: Thus the first Sunday in the first month is January 1; the first Sunday in the second month is February 5; and the first Sunday in the third month is March 3, the numbers being 1 and 5 and 3. This same system, used in relation to all the other week-days, is repeated every quarter continuing on indefinitely.

HAVE YOU HEARD?

By MARGUERITE BAIR FELBER

U. S. Office of Education, Washington.

A radio series under the title "Have You Heard?" is broadcast every Tuesday afternoon over the Blue Network of the National Broadcasting Co. The scripts are written by Mrs. Felber of the government's Office of Education. The following script, published in full with all the technical directions for music and actors, was produced on August 4. It is a popular discussion of Time and Calendar Reform, and in its dramatized form may prove useful to many readers as a basis for other broadcasts.

MUSIC: (WEIRD MYSTERIOSO FANFARE)

ANNOUNCER: Have You Heard!

MUSIC: (THEME . . . FADING FOR)

ANNOUNCER: This is your invitation to visit another fascinating corner of the world of natural science. Ladies and gentlemen—your Friendly Guide!

MUSIC: "OH! IT'S NICE TO GET UP IN THE MORNING" (CHORUS)

SOUND: (ON THE LAST NOTE OF SONG—RINGING ALARM CLOCK)

GIRL: Ohhh (SLEEPY AND PROVOKED)—there goes that alarm again!

SOUND: (SPITEFULLY STOPS ALARM . . . KNOCKS OVER CLOCK)

GUIDE: (FADE IN, CHUCKLING) Good afternoon, friends. That was a typical early morning scene, but really, now, this young lady shouldn't complain—she ought to be thankful she's living now—and not back when the world was created—because *then* the nights were only one hour long!

GIRL: That reminds me! Last week you said that days used to be only two hours long instead of twenty-four, and you promised to explain today.

GUIDE: I'll be glad to. Of course, you know that the length of a day is determined by the time it takes the earth to make one complete rotation.

GIRL: Of course.

GUIDE: Well, when the earth was first flung into space——

GIRL: (INTERRUPTS) Did you say the earth was flung into space?

GUIDE: Yes . . .

GIRL: Oh—please! Where was it flung from? And how?

GUIDE: I'll tell you all about it next week.

GIRL: But I want to know now!

GUIDE: I thought you wanted to hear about the time when days were only two hours long?

GIRL: I do. I'm sorry—I won't interrupt again. But I'll certainly be looking forward to next week!

GUIDE: (AMUSED) I'm glad to hear it. Now, as I was saying, when the earth was first flung into space it spun around on its axis once every two hours instead of once in every twenty-four—as it does today.

GIRL: So that's why the days were two hours long!

GUIDE: Yes. The period of darkness—or night—lasted only one hour at the equator—and was even shorter in other parts of the world.

GIRL: What caused the earth to slow down to its present rotary speed?

GUIDE: Don't you remember what I told you some time ago about the moon, and how its tidal pull caused the earth's speed to decrease?

GIRL: Oh, yes! That's right. Tides act as a brake and slow down rotation. (BRIGHTLY) Then some day we'll have even longer days and nights than we have now!

GUIDE: Yes.

GIRL: At least that's something to look forward to!

GUIDE: (LAUGHING) Yes—if you live long enough! Of course, the change is very gradual, amounting to only about one minute in six million years. But if you're that anxious to have longer days and nights why don't you move to the North or South Pole where they have six months of daylight and six months of darkness?

GIRL: Then the length of day and night is not the same the world over?

GUIDE: By no means! The length of day and night in different parts of the earth varies with the distance from the equator.

GIRL: I suppose I ought to know why that is, but somehow——

GUIDE: Because of the unequal distribution of sunlight over the earth's surface, which is mostly due to the motion of the earth around the sun, and the earth's inclination on its axis.

GIRL: Oh-h-h . . .

GUIDE: For instance, at the equator the day is always twelve hours long and so is the night, but the poles have a six-months day and a six-months night. Between these two extremes the days and nights vary in length.

GIRL: (LAUGHING) That's enough to daze anyone!

GUIDE: It certainly is! As a matter of fact ever since ancient times the inhabitants of the earth have been kept in a sort of daze in their attempts to devise suitable calendars and accurate methods of time keeping.

GIRL: You know, I never thought about it before—just took calendars and clocks for granted . . . but now that you've mentioned it, I realize that I know nothing at all about how time is determined.

GUIDE: Would you like to hear about it?

GIRL: I should say I would!

GUIDE: All right. We'll begin with Genesis 1, 14, which reads: "And God said, Let there be lights in the firmament of the heaven to divide the day from the night; and let them be for signs, and for seasons, and for days and for years."

GIRL: I remember that—but what do the stars and the sun have to do with calendars and time keeping—aside from the fact that the sun causes day and night?

GUIDE: Our calendars and our time keeping are based upon the movements of the sun, the stars, the moon and the earth!

GIRL: How?

GUIDE: Suppose we start with the calendar, which divides a year into months, weeks, days, hours, minutes, and seconds. There is a natural day, month, and year—but weeks, hours, minutes, and seconds are artificial units.

GIRL: I don't understand!

GUIDE: You will in a moment; because it is really very simple. Just remember that the earth spins around and around on its axis, and at the same time revolves around the sun. Like a spinning top traveling around in a big oval circle with a ball in the center of the circle to represent the sun.

GIRL: I can just see it!

GUIDE: Well, the spinning on its own axis we call "rotating." The earth rotates, or turns around once every twenty-four hours. That makes a day. But it takes 365 days and a fraction to revolve around the sun—so that makes our year.

GIRL: Oh . . . of course. But what about a month!

GUIDE: A month is the length of time it takes the moon to revolve about the earth. That's where the "month" gets its name—from the moon.

GIRL: Well—of all things!

GUIDE: The first method of keeping track of time was originated by the early Chaldeans.

GIRL: They're in the Bible. They lived four or five thousand years before the time of Christ.

GUIDE: Nevertheless—they had a calendar.

GIRL: Was it like ours?

GUIDE: No, it was much different. These ancient people were very much interested in the different phases through which the moon passed because many of their religious rites were associated with the moon.

GIRL: How interesting!

GUIDE: Each time a new moon appeared the priests would greet it with prolonged trumpet blasts—announcing to the population that a new month had begun.

GIRL: Well! Imagine that!

GUIDE: It is believed that the week had its origin in these religious festivals.

GIRL: How?

GUIDE: Because these early Chaldeans were so interested in the phases through which the moon passed, and although they kept time by the month, their calendar was divided into seven-day periods.

GIRL: (SURPRISED) Oh, was it?

GUIDE: Yes. We have had a seven-day week ever since, so doesn't it seem plausible to you that the Chaldeans, after observing that the moon went through four phases in a month, concluded that the month should be divided into four parts?

GIRL: It does sound reasonable.

GUIDE: It might interest you also to know how the days of the week got their names.

GIRL: Yes! I've often wondered about that.

GUIDE: They were named after what were known as the seven wandering stars; Sunday for the sun—sun-day. Monday for the moon, moon-day, or Monday. Tuesday after Tues—the Anglo-Saxon name for Mars. Wednesday after Woden—the Anglo-Saxon for Mercury. Thursday after Thor, meaning Jupiter. Friday after Friga, meaning Venus, and Saturday after Saturn.

GIRL: I never knew that before! Now the days of the week will mean something to me.

GUIDE: That's good.

GIRL: How did the Chaldean method of time-keeping come down to us?

GUIDE: Knowledge of it was carried from Chaldea to Alexandria, Egypt; from Egypt to Athens, and from Greece to Rome. It was the only method of time-keeping the earlier Romans ever used, and it continued in use until the time of Julius Caesar, about 45 B.C.

GIRL: What happened then?

GUIDE: By that time the calendar had gotten into great confusion.

GIRL: Why?

GUIDE: Since the moon goes through its cycles about thirteen times in the same length of time that it takes the earth to go around the sun, there should have been

almost thirteen months per year, but since there are not exactly thirteen months, if you keep time by the moon, very soon the seasons will not come out right, and that is just what happened.

GIRL: That's right—the seasons *would* get mixed up!

GUIDE: In order to correct this difficulty they had been using an "intercalary month"—"intercalary" means "between the calendar"—and they just inserted an extra month in the calendar whenever it was considered necessary—just as we have leap year.

GIRL: (LAUGHING) Well! At least then the girls in those days were lucky!

GUIDE: Why, what do you mean?

GIRL: They could have leap year every year.

GUIDE: (LAUGHING) Perhaps that was one of the things that caused the confusion. Anyway—in those days there were some sly fellows who discovered that by deliberately juggling the calendar and adding months—even when they weren't needed, they could lengthen their terms of office or add to the number of revenue payments they could receive.

GIRL: (LAUGHING) Imagine that! So they even had tricksters in those days!

GUIDE: Oh, my yes! But when Julius Caesar came into power he decided to right this inconvenient state of affairs.

GIRL: What did he do about it?

GUIDE: He sought the aid of the Egyptian astronomer, Sosigenes, and set to work revamping the calendar.

GIRL: Did they change it much?

GUIDE: So much that by the time they were through they had a brand new calendar!

GIRL: (AMAZED) What!

GUIDE: First of all, Caesar decided to ignore the phases of the moon and to base the calendar upon the length of time it takes the earth to make one complete revolution around the sun, about 365¼ days, and this period of time was called a year.

GIRL: Then he didn't divide the year into months?

GUIDE: Oh, yes—but he increased the number of days in them so that their total would equal the number of days in the year. Then he decided that January first should be New Year's Day.

GIRL: Why—wasn't January first *always* the beginning of the new year?

GUIDE: Oh, no! New Year's Day used to be on March first. March was the first month of the year up until that time, and December, taken from the Latin numeral, ten, was the tenth. January and February were the eleventh and twelfth months.

GIRL: Well—of all things!

GUIDE: Most of the old names of the months were retained, but Caesar changed the name of Quintilis, which had until that time been the fifth month of the year, to July after himself to commemorate the revision, and later, Sextilis, which once was the sixth month, was changed to August by Augustus Caesar.

GIRL: . . . (LAUGHING) And the good, the noble Caesar did, lived after him!

GUIDE: And no wonder! For the Julian Calendar was a great improvement over the old style method of time-keeping, and remained in effect for many years. It was not until the sixteenth century that any change was necessary.

GIRL: What was wrong this time?

GUIDE: The Julian Calendar was based on a year containing 365¼ days. In order to take care of the fraction every fourth year an extra day was added to the month of February.

GIRL: Then that's how leap year originated?

GUIDE: Yes. But with all its improvements the Julian Calendar was not accurate, and the error amounted to one whole day in 128 years, so that by the sixteenth century the seasons were again out of line and the first day of spring, or the vernal equinox, had worked forward to March 11th instead of coming on the 21st as it should.

GIRL: But why should that happen when a leap year was used?

GUIDE: The reason is that the tropical year, that is, the year of the seasons,

reckoned from equinox to equinox, is not exactly 365¼ days, but is actually 365 days, 5 hours, 48 minutes and 46 seconds in length.

GIRL: (LAUGHS . . . THEN) How did they come to revise the calendar this time?

GUIDE: Pope Gregory XIII was interested in the calendar because, in those days, back in 1582, time was in the keeping of the Church. He decided to revise the calendar because some of the religious festivals were gradually changing with respect to the seasons.

GIRL: You mean days like Easter Sunday?

GUIDE: Yes—that's a very good example. Way back in 325 A.D. Easter Sunday was designated as the first Sunday following the first full moon, following the Vernal Equinox, and at that time the date of the equinox was March 21.

GIRL: How is the date of Easter determined now?

GUIDE: The same way—the first Sunday after the first full moon, following the Vernal Equinox. It's been done that way ever since 325 A.D.!

GIRL: Well! I didn't know *that* before.

GUIDE: When the seasons got out of line Pope Gregory ordered that ten days be dropped from the calendar to bring the date of the Vernal Equinox back to March 21, and in order to keep it there he amended the Julian rule for leap year so that February would have 29 days on every year that is divisible by 4, except the century years that are *not* divisible by 400. Consequently the years 1700, 1800, and 1900, although divisible by 4, were *not* leap years.

GIRL: Are we still using the Gregorian calendar?

GUIDE: The Gregorian calendar was adopted in Roman Catholic countries in 1582, but it was not until 1752 that the British Parliament finally voted to adopt it. After that it was generally accepted and has been used ever since.

GIRL: I hope they don't change the calendar any more—I'm afraid I'd get all mixed up in my dates.

GUIDE: Then you should have been around when the Gregorian calendar was first adopted in Great Britain.

GIRL: What happened?

GUIDE: England had never accepted the Julian Calendar, and so when Parliament decreed that eleven days should be omitted between September 2 and 14, and that the beginning of the year should be moved from March 25 to January 1 there was general rioting on the part of the populace and the people claimed that they were being robbed of that much time.

GIRL: I can't say that I blame them much—that must have changed the dates for everything.

GUIDE: It did! And there was considerable confusion for some time, but the dates were eventually adjusted. For instance, have you heard that George Washington was born on February 11?

GIRL: I thought it was February 22.

GUIDE: It is according to the new calendar. George Washington was born on February 11, 1732, but when eleven days were omitted from the calendar in 1752, his birthdate became February 22.

GIRL: What do you think of that?

GUIDE: I think that even though the error in the Gregorian system will amount to only one day in about 30 centuries or about half an hour in an ordinary lifetime, it is still not entirely satisfactory.

GIRL: Why not?

GUIDE: Because the months range in length from 28 to 31 days; the number of business days in any month varies; there may be either 4 or 5 Sundays in a month, Easter may fall on any date between March 22 and April 25, and in addition to all these things an error still exists in it.

GIRL: You don't think they will change it again though, do you?

GUIDE: They might! Two excellent new arrangements have recently been discussed.

GIRL: By whom?

GUIDE: A committee appointed by the League of Nations to consider revision of the calendar.

GIRL: What are these two plans?

GUIDE: One arrangement has twelve months and makes the first month in every quarter 31 days long. All the other months would have 30 days each, making a total of 364 days or 52 weeks in the year.

GIRL: But then the year would not have enough days . . .

GUIDE: Oh, they have taken care of that. You see the 365th day would be called Year-End Day, and would not be counted in any week or in any month.

GIRL: But what would they do about leap year?

GUIDE: On leap year the extra day would be inserted before July 1. With such a calendar each quarter of the year would have exactly 91 days, beginning on a Sunday and ending on a Saturday, exactly the same for each year, and Easter would always come on the same date.

GIRL: It would be a drastic change, wouldn't it?

GUIDE: Yes—but probably a very convenient one.

GIRL: What is the other plan?

GUIDE: The second plan divides the year into thirteen months of 28 days or four weeks each. Year Day and Leap Day would be extra days and every month would be exactly like every other month.

GIRL: It sounds monotonous to me—I like variety.

GUIDE: (CHUCKLING) Anyway, we always have had and always will have time on our hands—no matter how we divide it.

MUSIC: "TIME ON MY HANDS."

GUIDE: Have you heard that although no one on earth has ever been able to go to a star, some scientists claim that living things from the stars have come to our earth?

GIRL: Do you mean living things from away out in space?

GUIDE: Yes!

GIRL: But how could that possibly happen?

GUIDE: I'll tell you next week.

MUSIC: (THEME . . . UP AND FADE)

ANNOUNCER: Tune in next week, same time, same station, for another presentation of "Have You Heard?" In closing we are pleased to announce that there is now available for free distribution an interesting leaflet entitled, "Curious Facts About the Calendar." This leaflet contains many facts of interest about the development of our calendar through the ages, as well as a summary of the information presented today. You may have it free by sending your name and address to "Have You Heard?" Office of Education, Washington, D. C.

CHINA FOR THE WORLD CALENDAR

DR. TSAI YUAN-PEI, President of the Chinese Government's National Academy in Nanking, has notified The World Calendar Association that China has officially approved of the international proposals for a revision of the calendar according to the 12-month equal-quarter plan. This is the result of a protracted study by a Chinese National Committee including representatives of the Ministries of Foreign Affairs, Railways, Finance, Communications, Industries and the Interior, with an additional representative from the National Research Institute of Astronomy, Dr. C. S. Yu.

"Questionnaires were distributed," writes Dr. Tsai Yuan-pei, "which effectively brought forth opinions from various walks of life regarding the desirability of the proposed change, and the type of revised calendar which would be most suitable to China. The consensus of opinion was favorable to calendar reform and overwhelmingly endorsed the 12-month plan as against the 13-month proposal. The 13-month scheme does not seem to appeal to the Chinese people."

OBJECT LESSON IN DATES

By WADE POSTON, JR.

Monday's child is fair of face;
Tuesday's child is full of grace;
Wednesday's child is loving and giving;
Thursday's child works hard for its living:
Friday's child is full of woe;
Saturday's child has far to go;
But the child that's born on the Sabbath day
Is blithe and bonny and good and gay.

WHICH are you? Are you "Fair of face"? "Full of grace"? "Blithe and bonny"? Or are you "stumped"? In other words, do you know the day of the week on which you were born? Please don't feel ashamed to admit it. You are one of a large human majority.

Now don't run to the nearest almanac. In a few more sentences, we're going to show you something interesting—a method by which you can calculate the day of the week for any date in the past or future, in the present Gregorian Calendar.

True, as you can see by glancing at the bottom of this page, the calculations involve a great deal of trouble. But long use has accustomed you to most of our present calendar's complexities. Surely you will not mind a few more!

Let us suppose, for instance, that your birthdate is September 15, 1911. You wish to find out the weekday on which you were born. Here's how:

Set down the last two figures of the year:	11
Add one-fourth of the same number, disregarding any remainder. One-fourth of 11 is:	2
Add the day of the month:	15
Add a certain figure, depending on the month, as shown in the foot-note table.* We'll call it a "ratio," and the ratio for September is:	6
The total is:	34
Divide by seven. (Seven days in a week.)	
34 by 7 is:	4 and 6 remainder

The remainder (6) indicates the day of the week for this particular date. That is, September 15, 1911, fell on the sixth day of the week, or Friday. In a like manner, Sunday would have been indicated by a remainder of 1, Monday by 2, etc. An even division, without remainder, indicates Saturday.

This formula is applicable to any date in the twentieth century—from 1900 to 1999. For a date in the nineteenth century, add 2 to your column before dividing. For the years between 1752 and 1799, add 4. Prior to

*The *ratio* for the various months is as follows: April or July, 0; January or October, 1; May, 2; August, 3; February, March or November, 4; June, 5; September or December, 6. In Leap Years, January, 0; February, 3.

the year 1752, the Julian Calendar was in use, a system that was anywhere from one to eleven days late.

Going into the future: For the years 2000 to 2099, add 6. Anything beyond that latter date probably doesn't interest you; but, if you have any use for it, the number for the next century—2100 to 2199—is 5.

Try your hand at it. What will be the date (weekday) of the fourth of July, 1939? Go ahead, work it out.

Tuesday? Sorry, you're wrong! The fourth of July, 1939, will come on a Wednesday. But before you start checking over your figures, a word of explanation. You have *not* erred in your calculations. But you *have* overlooked the revised World Calendar, a new timing system, favored for adoption in 1939.

The World Calendar is the final development of a wide series of calendar reform movements which have sprung up during the last century. In the opinion of most leading nations, this plan is the logical successor to the unbalanced, inconvenient Gregorian Calendar which is now in use. In fact, there is only one other important contender for the place, a system known as the 13-month plan.

This second movement, more radical of the two, has an extremely precision-like year of 13 months, each month beginning on Sunday and containing exactly four weeks. Since this type of arrangement would provide only 364 days, an extra day, following the last of December, would be added to round out the year. The advantages of the 13-Month Calendar lie principally in its precision sameness—its unvarying similitude of week, month and year. Its disadvantages are quite as real.

Imagine, if you can, a clock with thirteen hours. Now quickly answer the following questions: At what time is the day half over? A quarter over? Three-quarters? A third?

Some job! And in a year of 13 months, we find the same difficulties. The year would be half over on the fourteenth of Sol; a quarter over on the seventh of April; a third over on May 10. Think of the melee such an arrangement would cause, especially in business circles, where much accounting is done on a quarterly, not a monthly basis. Think of the resultant confusion in readjusting leases, rents, and insurance. And the trouble that would be caused in celebrating national, religious, and personal holidays if an extra month were added to the calendar!

On the other hand, the revised World Calendar offers practically all the advantages of the 13-month system, without any of its handicaps. Under this plan, the familiar year of twelve parts would be retained, but a few small changes would be made in the lengths of the individual months. For instance, February, long the outstanding eyesore of the Gregorian Calendar, would be brought up to a standard of 30 days. This, together with the addition of an extra "rounding-out" day at the end of December,

would permit all quarters of the year to be made equal. Each quarter would contain exactly 91 days. Each would coincide with the beginning of one of the months; hence, there would be no confusing "splits" for accountants to overcome.

Farmers, too, would appreciate the even-quarter plan, since it would mean accurate seasonal dating. Under a 13-month system, the seasons would begin, approximately on March 24, Sol 4, September 14 and December 19, supposing the extra month to be inserted between June and July. With The World Calendar, however, regular quarterly divisions would stabilize the seasons at the same monthly date for the entire year. This is of obvious advantage in farm reckonings.

In the past, many persons have been wary of calendar reform, since they believed that Christian churches, in general, looked upon it with disfavor. Nothing could be farther from the truth. Out of 1178 replies to a questionnaire, from clergymen of all denominations, 90 per cent enthusiastically supported the proposed reform of the calendar. Then again, repeatedly in this journal there have appeared the articles and statements of eminent religious leaders, all of whom favor a revised dating system. In behalf of the Roman Catholic Church, the Vatican has declared that there are no doctrinal reasons why the change should not be effected. The Universal Christian Council of Geneva, too, after conducting a survey of non-Roman churches, reported that the overwhelming majority of the churches favor not only stabilization of Easter, but also general calendar reform, eventually of necessity to be connected with Easter stabilization.

Very definite action was taken by the Episcopal Church at its convention in Atlantic City, where the assembled members adopted a resolution specifically approving The World Calendar. The Eastern Orthodox Church, too, is an outstanding proponent of reform. It fully appreciates the perplexities of our present system, as it is just now revising its religious holidays from the Julian to the Gregorian Calendar.

It is hard to conceive of a trade or profession in which the 12-month revised calendar would not be of benefit. What is *your* position in life? Are you a merchant? Then your sales statistics are accurately equalized four times a year. Are you a teacher? Then your class schedule needs to be made only once, not annually. Are you a landlord? Then you will appreciate the fact that half-yearly contracts run for 182 days, not for either 181 or 184. Are you a clergyman? Then you will enjoy the benefits of a fixed Easter.

All businesses and occupations are integrally bound to the calendar. An improvement in the calendar is an improvement in business facility and in the still more important business of living.

ROMANCE OF THE CALENDAR

By P. W. Wilson

CHAPTER SIX: MOON AND MONTH

IN READING the riddles that lend mystery to the romance of the calendar, we cannot but be impressed—possibly amused—by a perpetual paradox. On the one hand, the pages of record are inscribed with human traditions, customs, memories that are quaint as the ornament on a mediaeval manuscript. On the other hand, the astronomer imprints upon every paragraph the minutiae of the strictest mathematics. There is sentiment playing like summer lightning around the solid structure of cold and unemotional science.

Gazing upon the moon, we are entertained especially by this charming —even grotesque—inconsequence. There are puerile absurdities that distract the attention. Yet the absurdities are as a fitful floodlight that reveals age-long exactitudes at which we can only be silent in astonished awe. Any comment would be inadequate to a miracle thus majestic.

On any given evening, how many of us could say off hand where, if anywhere, we would look for the moon? Never is Diana to be discovered save where and when she wants to be. Among the myriad suns and their satellites that waltz around one another in the glittering court of the celestial kingdom, this "Queen and Huntress, chaste and fair"—has been the most wayward in her bewitching of the imagination.

The sun is regular in his habits. He rises above the horizon, and it is below the horizon that he sets. But the moon! It is only by accident that she rises and sets. Here is a fairy godmother who, more often than not, suddenly appears in mid-sky—emerging in her glorious sheen from nowhere, vanishing into nowhere, and for no reason that is obvious to the onlooker. According to what seems to be her own sweet will, the moon thus changes her aspect and position from day to day, entering on the scene without warning as a crescent, waxing into full orb, waning into a contrary crescent and thus fading away into a fathomless infinity.

A little research is enough to demonstrate that the moon obeys the laws of motion. Despite all impious and impish insults against "the sacred queen of night," her arrows, as she aims them, never fail to hit the mark. For the moods of the moon, there is a precise explanation. The rhythm of her dance is absolute in its ascertained punctualities. She swerves, she sways, but only according to that universal gravitation which is the music of the spheres.

If the Romans described the moon as *luna*, it was in admiration. The word *luna* is a colloquial form of *lucna* and is associated with *lucere*, to

shine—indeed, with *light* itself. The moon is the orb that illuminates.

The word *moon,* with which we make so free, is found in the original vocabulary by which man first expressed his thought in language. *Moon* is akin to the Aryan *Maonh* and therefore to the Sanskrit *mas,* the Greek *men,* the Irish *mi,* the German *mond,* the Dutch *maan,* the Danish *maane* and the Mexican *metzle.* The derivative word *month* appears in Latin as *mensis.* In one form or another, the word *moon* is universal.

To a student of the calendar, the root of the word is full of significance. It is *me* as found in the first syllable of measure—the moon is thus the measurer of the month, and the phases of the moon have furnished the most obvious—therefore, the earliest—of all known standards by which time has been calculated. Without an exception, it seems as if the primeval calendars were lunar in origin, and some of them—for instance, the Hebrew and the Mohammedan—are lunar to this day. The emblem of old Turkey was a crescent moon with a planet within its horns.

It is the moon as a measurer that here demands our attention, and how shall we explain its function? We say that the moon moves around the earth and, in a sense, so it does. Yet its wanderings are not quite so simple as that. Perhaps we may best understand the motion by thinking of a merry-go-round at a village festival. Some of these arrangements for indulging in the genialities of giddiness are fitted with small circular cars which revolve on their own axis while that axis is swept around the central pillar. Let us suppose that the pillar is the sun, that the axis is the earth and that the passenger on the rim of the car is the man in the moon. Then let us watch what happens.

As he swings around, the passenger looks steadily towards the axis of the car, and so does the man in the moon. He is always gazing at the earth. From time to time, we may see a little more of one ear and a little less of the other. But not for an instant does this rude fellow, as he stares at mankind, allow us to catch a glimpse of the back of his head. The world sees half the moon, but the moon sees all the world.

The world is still a smouldering cinder that sometimes emits a spark—what we call a volcanic eruption. The moon is dead and cold and white as a ball of ivory. It has no fires within itself, but is a placid reflector of fires elsewhere, and this is the simple circumstance that explains the behavior of the moon which evoked so much irreverence among our forefathers. The man in the moon can only be seen when he is illuminated by the sun and even so he can only be clearly seen by those whose eyes are shaded from the sun. Hence his appearances and disappearances when soaring in mid-heaven above our heads.

A month may be defined as the period within which the moon completes his regular performance; and most of us define a month as the time that it takes the moon to "go round the earth." There are, however, complications.

If the earth were standing still and the moon were revolving around the earth like a speck of dust on the rim of a wheel, a month would be just over 27 days 8 hours. Even so this month varies slightly according to the method of calculation. There is the sidereal month (27.32166 days) based on the relation between the earth, the moon and the far distant stars. It is virtually the same as the tropical month (27.32156 days) based on the equinox. The anomalistic month is slightly longer (27.55455 days). It is the period that elapses between what is called perigee and perigee—which term simply means the moments when the moon, in its slightly elliptical orbit, is nearest the earth. Another month is known as nodal or diaconic (27.21222 days), and this month is a little more delicately adjusted. The orbit of the moon is in one plane. The orbit of the earth is in another plane. Where these planes intersect, there is a straight line pointing to the nodes, and the nodal month is reckoned relatively to this line.

All of these months are important to the astronomer. None of them concern us in our study of the earlier calendars. What primeval man noticed was the new moon. The question that he asked was how long a period of time elapsed before there was another new moon. In his elementary way, he was thus calculating what we call the synodic month and in this month, obviously, we must include the sun that lights up the new moon. Let us see how it works out.

It is not so very difficult to understand the synodic month if we give our minds to it. Let us take a moment when (1) the central pillar of our merry-go-round, that is, the sun, (2) the axis of the revolving car, that is, the earth, and (3) the man on the rim of the car, that is, the moon, are in the same plane—with the man on the outer edge of the merry-go-round. Then let us watch until the three of them are again in exactly the same relative positions—that is the central pillar (the sun) the axis of the car (the earth) and the man on the outer edge (the moon)—all of them in the same line as before. If we reckon up the interval that has elapsed between these two alignments, we shall find it has been 29.53059 days—that is 29 days, 12 hours, 44 minutes 29 seconds. This is the synodic month with which we are concerned in our study of the calendar.

The synodic month is about 2 days longer than the other months, and for this difference there is a reason. The moon proceeds on its minor orbit. But the earth also moves on its major orbit. The moon has thus to traverse more than 360 degrees around the world before it reaches a point of alignment with the sun. It takes the moon the extra two days—as it were—to catch up with the advance of the earth.

The motion of the moon is thus ascertained to the fraction of a split second, and we may dismiss from our minds, therefore, any idea that the lunar month, found in so many old calendars, was ever speculative or inaccurate. It was for no such reason, as we shall see, that, in the most

widely used of the calendars, it became obsolete. The moon, if carefully observed, is as perfect a measurer of time as its name implies. If the calendar is to be based upon a period of 29½ days as unit, the moon provides precisely the yardstick that is needed.

It is not only on the exactitude of the lunar month that the prerogative of the moon as measurer of time is based. The chronologist, working in partnership with the astronomer, has extended the range of lunar measurement over thousands of years and has applied the time-table to the perspectives even of primitive history itself. In the determination of dates, he has found that the moon is indispensable. She supplies the historian with a metronome.

It is by a familiar comparison with the game of golf—that we can best appreciate these abstrusities. On the putting green, it is customary to describe a distressing situation as a "stymie." In the middle of the green there is the hole towards which the balls are played. But as luck has it, one ball lies in direct line between the hole and the other ball, so interfering with the desired putt.

The solar system is like a vast putting green where the sun serves as the hole and bodies moving around the sun are sometimes stymied. When the earth passes between the sun and the moon or when the moon passes between the earth and the sun, it is what we call an eclipse, and in the measurement of time eclipses are as the striking of the hours.

If the orbit of the earth were in the same plane as the orbit of the moon, there would be, obviously, two eclipses visible every month. First, the moon would pass between the sun and the earth and secondly the earth would pass between the moon and the sun. Eclipses would thus attract as little attention as the other phases of the moon. They would be accepted as astronomical routine.

In fact, the plane of the moon's orbit is tilted at an angle of about 5 degrees compared with the plane of the earth's orbit, and owing to this tilt the moon and the earth play at what we may call hide-and-seek—avoiding one another's shadows with elusive ease. It is only now and then that they get in each other's way. If the moon obscures the sun, it is a solar eclipse. If the earth obscures the sun and throws the moon into shadow, it is a lunar eclipse. Solar and lunar eclipses may be total or partial, and they are visible in particular and predictable regions. Solar eclipses are seen in the daytime—lunar eclipses are seen at night.

These are the occasions that the chronologist is careful to note and he finds that eclipses run in cycles which are so exact as to be retrospective over the past and prospective over the future. The eclipses themselves occur in space. There is also the question in what regions of the earth a particular eclipse is visible and this depends on the earth's revolution on its axis. The visibility of eclipses, past and present, has been charted for

thousands of years and the results, carrying the memory of man back to the remotest antiquity, are amazing in their certitude. A few out of many examples will illustrate this triumph of the lunar chronology.

In B. C. 213, the Emperor Chin ordered the books of China to be burned. Of the lost archives, there are, however, traces still extant and we have the interesting record that, about 39 centuries ago, the king, Chung K'ang, ordered the Marquis of Yin to march an army against Hsi and Ho, the hereditary astronomers who, indulging in drink, had failed to foretell an eclipse. Without a word of warning from these delinquent scientists, "the sun and moon did not meet harmoniously" and His Majesty was taken by surprise at the sudden omen. The duty of studying eclipses was thus regarded as sufficient to provide a *casus belli.*

The Shih King or Book of Poetry mentions an eclipse of the moon followed by an eclipse of the sun. The allusion points to the year 776 B. C.—twenty-seven centuries ago—when there was a lunar eclipse on August 21 and a solar eclipse on September 6.

In the Book of Amos, we read: "and it shall come to pass in that day, saith the Lord God, that I will cause the sun to go down at noon, and I will darken the earth in a clear day."

This eclipse has been identified. In Assyrian records we read of "insurrection in the City of Assur. In the month Swan, the sun was eclipsed." The year was 763-2 B. C. and on June 15th the eclipse occurred.

In the Odyssey, Homer tells how Ulysses, after his wanderings, returned home and, in fury, slew the rapacious suitors of his wife, Penelope. "The sun," we read, "has perished out of heaven and an evil mist has spread over all." On April 16th, 1178 B. C. there was a solar eclipse which was total around Ithaca where Ulysses lived. Can it be that the legend is vindicated by lunar evidence?

Apparently the poet Archilochus alludes to a total eclipse of the sun on April 6th, 648 B. C. Pindar mentions a solar eclipse which was nearly total at Thebes on April 30th, 463 B. C. Herodotus, describing a battle between the Lydians and the Medes, tells of a total eclipse of the sun on May 28th, 585 B. C. Many other examples of such ancient eclipses could be given. Thus abundantly has the moon—so wayward in her wanderings—justified her prestige as the original and universal measurer of time.

CENTRAL COMMITTEE ON CALENDAR REFORM

ORGANIZATION is announced at Geneva of an "International Committee of Cooperation" on Calendar Reform, with offices at 3 Rue Butini, near the League of Nations' headquarters. The Committee will act as a liaison body between the 25 national committees on calendar reform and the official bodies concerned with this matter, including the League of Nations, the International Labor Office and the various governments. The central Committee is under the chairmanship of the President of The World Calendar Association, with the following vice-chairmen: Rt. Hon. Lord Desborough, England; S. E. M. Alfredo de Castro, vice-president of the League of Nations Advisory and Technical Committee for Communications and Transit; S. E. M. Gonzalo Zaldumbide member of the Council of the League of Nations; Senator C. Mertens, Belgium; Archbishop Germanos of the Eastern Orthodox Church; Bishop William T. Manning of New York; Professor Carlo Ferri, vice-rector of the University of Pavia, Italy; Abbé Chauve-Bertrand of France; Professor A. Keller of Switzerland; Senator Justin Godart, France; S. E. Fernando Garcia Oldini, Chile. The Secretary-General of the International Committee is M. Raymond Mage of Geneva. An Advisory Board includes calendar authorities of Great Britain, France, Canada, South America, Spain and the United States.

EXCERPTS AND REVIEWS

What's Wrong and Why?

By E. B. MERRILL

(From the *Canadian Forum,* Toronto)

WHEN calendar revision is mentioned, most people will ask: Why? What is wrong with the calendar? When we start to consider it, however, we soon realize that it is really a deplorable mess. We have months of 28 to 31 days without regularity of sequence; quarters of 90 to 92 days; half-years of 181 to 184 days; 24 to 27 work-days per month, without considering holidays; the period from New Year to Easter varying by 35 days; this year not like the last nor the next; our dates continually changing to different days of the week from year to year.

These are faults due either to exigencies of calendar evolution or merely to caprice. Our calendar is one of the things that a conspiracy of perpetuating influences has managed to survive in obvious error for some 2000 years, with only small corrections. The longer it has run the more difficult it has become to make a complete revision.

The Romans gave us a perpetual if somewhat irregular calendar—each year like the last, excepting for leap-year day. But that was because there was then no 7-day week in Rome. The 7-day week came more than three centuries later. And when the week came into the calendar, no attempt was made to adjust it to the year, to keep the calendar perpetual.

It has taken us all these centuries to realize that a regular, perpetual calendar is highly desirable and quite possible, depending only on the acceptance of one fundamental device—the creation of one or two 8-day weeks. This is the key to the problem. The rest is simple. And this device has been generally accepted by those who have considered the alternatives.

To have our calendar perpetual we must have an exact number of weeks. Now, 364 days are exactly 52 7-day weeks. Placing an extra day in one of these gives us our normal 365-day year and an additional day in another week gives us leap-year. All future corrections whatsoever would be taken care of by inserting or omitting this second day. With the 52-week year divided into months and quarters, the next 52 weeks will have the same arrangement of weeks, months and quarters—a perpetual calendar.

Thus we have what is generally known as the "World Calendar," which now appears to be favored by some of the leading countries. Its regularity and simplicity are appealing and there is a minimum of disturbance in the transition from old to new systems.

Simple and Clear

By DR. ALBRECHT PENCK

Emeritus Professor of Geography,
University of Berlin

(From *Deutsche Allgemeine Zeitung,* Berlin)

MOST people do not realize how defective and complicated is the present arrangement of our calendar. It is fairly easy, for example, to remember which months have 30 days and which have 31, but to say on what week-day the 4th of May, 1871, fell, requires calculations so difficult that it is better to consult a reference book of some kind.

An international movement is now in progress for correcting this situation. The plan for dividing the year into 13 months of 4 weeks each hardly needs discussion: at first glance this proposal has a striking neatness, but it has a great defect that renders it impossible—it divides the year into 13 months, a number so awkward that it inspires hesitation in everybody. I do not like this scheme. And the opposition to it is well-nigh universal.

But I fully approve of the plan for equal quarters and half years. This proposal has just earned the approval and advocacy of the oldest learned society in the United States—the American Philosophical Society, founded by the celebrated Benjamin Franklin. According to this plan, the year is divided into 12 months, of which all have 30 days except the first month of each quarter, which has 31 days. This gives a total of 364 days, to which is added an intercalary Year-End Day and in leap years an intercalary Leap-Year

Day. The simplicity of this arrangement can be seen from the diagram of a typical quarter-year. This diagram is good for all quarters and all years, in perpetuity.

The proposal is simple and clear. It is hoped that all the nations which are members of the League of Nations; and also all those which are outside the League, will soon give it their approval. Its enactment will be a gain for all mankind.

Library Jottings

By B. S. S. Green

Public Librarian, Bartow, Fla.

ANY public library serves to illustrate some of the objections to our abominable Gregorian calendar. Like the schools, libraries would like to have a calendar system which would divide the months more evenly, and one that would make the incidence of holidays less haphazard.

The present calendar is a hodge-podge of months of various lengths. For instance, it happens that, in library practice, October of last year had 25 per cent more working days than the shortest month of the year. This upset accounts and statistics and working programs perceptibly. Expenses were increased, but the library budget remained the same.

Other enterprises more complicated than libraries suffer from calendar irregularities in a still more serious way.

Rotary Club Action

By Luis Montero y Tirado

Peruvian Delegate to International Rotary Convention

(From *La Voz Rotaria*, Lima, Peru)

IMPORTANCE of the reform of the present Gregorian calendar is becoming better known each day, as is shown by the world-wide movement under the leadership of the League of Nations. Interest in this movement increases with the approach of the year 1939, when the change to the new system should take place. On January first of that year it will be possible to substitute, without any trouble or inconvenience, a perpetual calendar for the present Gregorian system. The new plan modified the old only slightly, yet in a very important manner, adapting it to the religious, legislative, statistical and commercial needs of the modern world.

In Peru a committee for promoting this reform calendar has been organized and has developed a plan of action which has insured the adherence of the Peruvian government to the plan of The World Calendar, so that our national delegates in Geneva will support this plan at the first opportunity.

As for the interest of Rotary Clubs in this matter, the central office of International Rotary in Chicago has already recommended to all its clubs the study of the question, and for this reason the clubs in Peru have placed it on their regular program and have made its importance known to the public through the press.

Business Needs It

By J. W. Musselman

Editor *Pacific L. and D. C. Journal*, San Francisco

THROUGH passing centuries civilized peoples of all nations have recorded time under the perplexing calendar devised by Julius Caesar and improved centuries later by Pope Gregory. Since then business development and changing geographical lines have brought an increasing demand for a better tabulation of weeks and months to lessen the handicaps of recording events.

Scores of reasons are advanced for a change, each practical and reasonable, which will bring lasting benefits. The new 12-month calendar is planned to equalize the days of each month, making it possible to adjust business and accounting and especially to permit an adequate comparison of statistical information. Some 27 nations have now indicated their advocacy of the improved calendar, and other nations are coming into line.

Business men, of course, will welcome a standard pay-week of 52 rather than 53 annually. The world moves on the measure of time. All calculations, salaries, interest, insurance, pensions, leases and rents are fixed on some division of the year and all are now inaccurate. With the adoption of the new calendar they will be readjusted and improved.

CURRENT PRESS COMMENT

Gathering Strength

New York Times

Two calendars are now contending for adoption. One, advocated by The World Calendar Association, has 12 months of four equal quarters, with intercalary days at the end of each regular year and the middle of each leap year. The other, the 13-month Cotsworth calendar sponsored by the late George Eastman and adopted by some business houses, seems to be losing ground because of grave objection to the insertion of a whole extra month between June and July. The two calendars would be considered again this year by the League of Nations on the request of two important members. If the sentiment that prevailed at the time of the last consideration (1931) has gathered strength, which is likely when we remember the endorsements that have since been secured from many churchmen and business organizations, the world may be asked to adopt the 12-month reform calendar in 1939. In that year January 1 falls on a Sunday. Such an opportunity will not occur again until 1950.

Desirable Simplification

Ypsilanti Press

Calendar reform is up again for consideration at the League of Nations. It is believed that calendar revision will simplify many business and legal matters. Sound reasons for it are advanced by sensible people.

Labor Acts

Manchester (Eng.) Catholic Herald

The International Labor Conference at its recent meeting at Geneva unanimously adopted a Resolution proposed by the Chilean Government delegate and supported by the Belgian delegate, urging the Council of the League of Nations to devote immediate and intensive study to the whole question of calendar reform.

The Resolution called attention to the perpetual calendar of 12 months and equal quarters recommended by the American Labor Conference in January. This system of reform (which is the same as that recently advocated by the Associated British Chambers of Commerce) embodies a fixed Easter in a fixed year in which every quarter begins on a Sunday and ends on a Saturday.

Economy and Efficiency

Indiana (Pa.) Gazette

Advocates of The World Calendar point out that besides its advantages on economy and efficiency, it facilitates statistical comparisons, coordinates the different time periods and stabilizes religious and secular holidays. Transition from the present to The World Calendar can be made without disturbance, they say, on January 1, 1939, which will fall on Sunday. After that time, if the powers agree, you may be able to know 20 years in advance that your birthday will be on a certain day of a certain week because it will never vary. The same thing will hold true of pay days and if your vacation starts on the first of July every year, you will know that it will be Sunday, the Fourth of July will always be on Wednesday, Armistice Day will be on Saturday every year and Christmas will be on Monday. There is much in favor of The World Calendar.

Objections Removed

Providence Journal

The 12-month plan, as has been emphasized again and again, removes the objectionable irregularities of the present calendar without setting up a dead level of uniformity of months and an irregularity of the year immeasurably worse than any that now exists. Such a calendar would be perpetual, and except for Leap Year would require no change from year to year. Any given date would always fall on the same day of the week. For commercial, financial and all statistical purposes, all quarter years would be exactly alike, and every month would contain exactly 26 week days.

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MEETING in far-away New Zealand in October 1936, the Fourteenth Congress of the Federation of Chambers of Commerce of the British Empire passed the following significant resolution on the subject of calendar reform, carrying through to a conclusion the similar resolutions passed during the past few months by the London Chamber of Commerce and by the British Federation of Chambers of Commerce:

"This Congress, while re-affirming the resolutions adopted at previous Congresses emphasizing the great benefits which would accrue to trade and commerce from a fixed date for Easter, is convinced that the attainment of this object can best be achieved as part of a general reform of the calendar.

"The inefficiency of the present system is obvious when it is realized that the same quarters are not comparable for statistical purposes from year to year, owing to the varying number of working days in them.

"The Congress therefore urges His Majesty's governments throughout the Empire to use their influence to secure the adoption of a perpetual twelve-month calendar, divided into equal quarters of 91 days, and a fixed date for Easter."

Readers of the JOURNAL are familiar with the history of calendar reform in the councils of the various great Chambers of Commerce throughout the world. The cause of revision was first sponsored on a practical international basis by the International Chamber of Commerce, which four times in the past ten years has stated in pointed resolutions its keen desire to see the matter carried to the stage of enactment. A fifth resolution, reaffirming once more the International Chamber's continued interest, was formally submitted to the resolutions and agenda committee this month, and will presumably come before the next Congress.

The British Chambers, under the spirited leadership of Lord Desborough, have reinforced the attitude of the International body in pushing the subject on to governments with recommendations of urgency.

In the United States, the United States Chamber of Commerce has long advocated calendar reform, and countless state and local Chambers have actively aligned themselves with the movement toward a new calendar.

RECENT CALENDAR RESEARCH

British Commerce Studies

By A. deV. Leigh

Secretary London Chamber of Commerce

(From an official statement to the British Press)

FOR some time past, the London Chamber of Commerce has had before it the respective merits of two proposals for a perpetual calendar, one based upon 12 months and the other upon 13 months. After careful consideration the Council, on the advice of the Honorary officers and the Executive, came to the conclusion that the 13-month calendar would not be generally acceptable, but that the scheme for a 12-month perpetual calendar would confer a number of important advantages.

The proposal would insure, for example, that any given day in any given month would always fall on the same date, that the same quarter in each year would contain the same number of working days, and that there would therefore be a comparable basis for accounting and statistical purposes. The adoption of this scheme would carry with it the fixing of Easter, a reform for which the London Chamber has consistently pressed and for which provision was made in the Easter Act.

Lord Desborough, who is attending the conference which is being held under the auspices of the League of Nations on calendar reform, has undertaken to represent the Chamber's views on that occasion, and also to move a resolution on its behalf at the forthcoming annual meeting of the Association of British Chambers of Commerce. A resolution is also being submitted to the Congress of Chambers of Commerce of the British Empire.

The Council of the London Chamber of Commerce has sent to the Prime Minister, the Secretary of State for Home Affairs and to His Holiness the Pope the following resolution which was unanimously adopted by the organization April, 1936:

"That the London Chamber of Commerce, which after many years of advocacy saw the Easter Act put on the Statute Book in 1928, is convinced that the fixing of the date of Easter, which would confer great benefits upon trade and commerce generally, can best be made effective as part of a general reform of the calendar. The inefficiency of the present system is obvious when it is realized that the same quarters are not comparable for statistical purposes from year to year owing to the varying number of working days in them.

"The London Chamber of Commerce therefore urges His Majesty's government to use its influence at the Conference to be held under the auspices of the League of Nations, to secure the adoption of a perpetual 12-month calendar divided into equal quarters of 91 days, and a fixed date for Easter."

The same resolution was moved by Lord Desborough at the meeting of British Chambers of Commerce, and seconded by D. G. Ackroyd, on behalf of the Bradford Chamber of Commerce. Notice of the terms of the resolution had been circulated in advance to over 100 Chambers in Great Britain, representing 50,000 members, and it was adopted unanimously after debate by a fully representative meeting of delegates from the Chambers.

In transmitting this resolution to the British government and the League of Nations, the secretary of the British Chambers of Commerce said: "I am requested to draw your particular attention to the conclusion of the third paragraph of the resolution. The Association considered the two proposals for reform which have been put forward by the League of Nations, and after due deliberation it approved the 12-month equal-quarter scheme mentioned in the resolution."

Church Investigation

By Dr. Paul Press

Chairman Calendar Reform Committee of the General Synod of the Reformed Church

(From the Official Report, Adopted and approved by the governing body of the Reformed Church)

IT has been an interesting study to follow the growth of an idea which originated even before civilization made any contribution. In its embryonic setup as far back as the primitive age some form of calendar guidance was in vogue. In following pur-

suits of life, primitive man was guided by the seasons of the year, the changes of the moon and the course of the sun. In observing the regular changes of the moon, it was easy to determine the passing of weeks and consequently we learn the designation which they gave to these changes, as for instance a certain event having transpired after so many moons. As soon as people began to form groups and to herd together, as in villages, the need of calendar guidance became apparent and a primitive science was evolved.

These so-called scientists soon learned that the passing of time had some relation to the movements of heavenly bodies, the sun, moon and stars, which led to a study which we readily recognize as astronomy. The early astronomers were priests, magicians and mathematicians, who with their limited knowledge however naturally grew into a better understanding of the forces of nature and in the course of time were enabled to discover the relationship between the moon, the stars, the sun and the seasons.

More than 6000 years ago the Egyptians were using a calendar of 360 days, 12 months of 30 days each, to which were added extra days every year to conform with the Egyptian sun. Greece and Rome also developed some form of calendar guidance. Julius Caesar has the distinction of having made the first definite contribution toward preparing a scientific calendar.

Science had made great strides in the period of the Roman era; it soon became apparent that a perfect calendar could be devised only by conforming to the supposed movements of the sun. Men learned by careful study that the actual length of the year is 365 days, 5 hours, 48 minutes and 46 1/7 seconds. The difficulty which caused much annoyance and disturbance presented itself in devising a calendar in which there could be an adequate and accurate distribution of weeks and months.

The calendar devised by Caesar, though imperfect, served civilization for sixteen centuries, until Pope Gregory XIII in 1582, guided by the advice of astronomers and mathematicians, ordered a revision of the calendar.

The Gregorian calendar has been in use up to the present time without any changes, although during this long period suggestions for possible changes had been made which received scant attention. The old Gregorian calendar seemed good enough to meet all needs.

Now, as we come to the latest revision of the calendar which engages our attention, we find the reasons for a change growing out of many demands which have come from time to time, dating far back in the past. The leaders in many branches of human endeavor—religion, science, business, education and government, base their demands for a revision upon the world changes in the late centuries, upon the improvements in communications, international relationships, as well as upon certain inaccuracies which present themselves regarding fixed dates for Church holidays, uniform arrangement of work days, length of months, etc.

The demands for calendar reform have not come from the masses of people but rather from scientists and philosophers. It is interesting to note, however, that the masses do come into real consideration and that any calendar reform must conform to the needs of the masses as pertains for instance to agriculturists, workers and the Church. It seems to be quite essential that no changes in the number of weeks, months or seasons should be considered, and that the change from the old calendar to the new should come about without much interruption. The demands for a revision have come from 50 different countries and have been directed to the League of Nations.

National Geographic Society

CALENDAR reform is the subject of a recent Bulletin issued by the National Geographic Society in Washington. After a comprehensive survey of the calendar changes in past history, the Bulletin says:

"It is not unlikely that there may be another change in our calendar. Of the more than 200 plans for calendar change studied by the commission on communications and transit of the League of Nations in Geneva, two have been singled out for special consideration. They are the 13-month year and the year of 12 months in four equal quarters."

The Bulletin continues with a detailed exposition of the two proposals.

FROM THE MAIL BAG

The purpose of The World Calendar Association is of importance as wide as the world and as deep as the life of humanity.—Rear Admiral R. P. Hobson, Pres., World Narcotic Defense Assn., N. Y. C.

I favor the 12-month equal-quarter plan as being very much more feasible of adoption. I fear that the 13 month plan will be most impossible to put over in view of powerful church opposition. — E. Clague, Dir. of Research, Pa. School for Social Work, Phila., Pa.

We are of the opinion that a new calendar must keep the division of 12 months and that the year should be divided into four identical quarters. The division into 13 months does not suit our customs. We shall do all that is possible to have Belgium favor this plan at Geneva.—A. Rey, Pres., Synod of Protestant Evangelical Churches of Belgium.

The present calendar is a source of confusion to all students. Your proposal seems most reasonable.—A. E. MacNeill, Harvard Univ.

I enjoy your JOURNAL immensely, and plead your cause whenever an opportunity presents itself.—G. L. White, Secy., Richmond Bus. College, Richmond, Va.

We wish this world-wide movement every success.—K. Bose, Gen. Secy., Natl. Council of Women in India, Calcutta.

I am very much interested in calendar reform. Every living person should be in favor of what will make life more enjoyable by simplifying the experiences and conventions of the race.—P. S. Peterson, Rolling Prairie, Ind.

I am convinced the new calendar will come but wish its coming could be expedited. A fixed Easter would mean much to the Church.—Rt. Rev. Benj. F. P. Ivins, Bishop of Milwaukee.

There is no question! The World Calendar is the one that should be adopted.—T. L. Larsen, Secy., Building and Loan Assn., Reno.

I am in favor of calendar reform as stated in the resolution of the American Association for the Advancement of Science and I am opposed to the 13-month calendar plan.—Bancroft Gherardi, Vice-Pres., Amer. Tel. & Tel. Co., New York.

I am very glad, indeed, to send in my enrollment. I find the copies of the JOURNAL intensely interesting.—Prof. C. L. Durham, Cornell Univ., Ithaca, N. Y.

I believe that all scientists would be disposed, as I am, to favor any well considered plan for simplification of the calendar.—John B. Whitehead, Dean of Engineering, Johns Hopkins Univ.

Your calendar would be a great aid to comparative statistics in business.—T. T. Ferguson, Cape Girardeau, Mo.

I have long felt that a change in our calendar is advisable.—Compton I. White, House of Representatives, Wash., D. C.

I am greatly interested in the proposal. —James R. Angell, Pres., Yale Univ.

Keep up the good work. We will have our new calendar some of these days.—O. L. Dustheimer, Prof., Berea, Ohio.

As regards the study of geophysical subjects such as meteorology, terrestrial magnetism and atmospheric electricity in which much statistical information is presented in the form of hourly values and monthly and annual means it would seem that a year of 12 equal months and 4 equal quarters would be most convenient. —J. Wadsworth, Dir., Apia Observatory, Western Samoa.

I am in favor of The World Calendar.—J. H. Northrop, Rockefeller Inst. for Medical Research, Princeton, N. J.

We believe thoroughly in calendar reform, and have no doubt that The World Calendar is the best proposition yet made. We have done what we could in our paper to forward the movement, and will be glad to continue.—C. C. Harvey, Publisher, Fort Fairfield Review, Me.

I have read with interest the literature regarding The World Calendar and I must say that it appeals to me.—Dr. E. F. DuBois, N. Y. Hosp., New York City.

I quite agree with The World Calendar of 12 months.—Prof. G. Silva, Dir., Royal Astronomical Observatory, Padova, Italy.

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